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JUNE 1985 BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE Vol. 5 No. 6

See it, hear it, play it

Why everyone's in the spin-off game

We test the CBM-128, Amstrad 664 and Atari 130XE

BBC Rock Run and Amstrad Englebert

Spectrum Wizard's Den and Multifont

CBM-64 Racer and Dismon

QL and Spectrum sprites

NEW BBC MICRO — FULL DETAILS

HEALTH WARNING: BOUNTY BOB CAN SERIOUSLY DAMAGE YOUR SANITY!

YOUR COMPUTER

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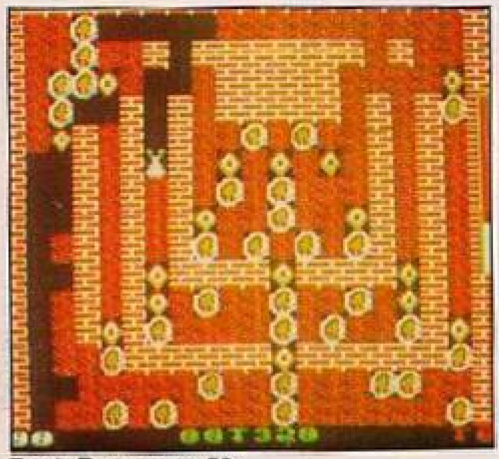
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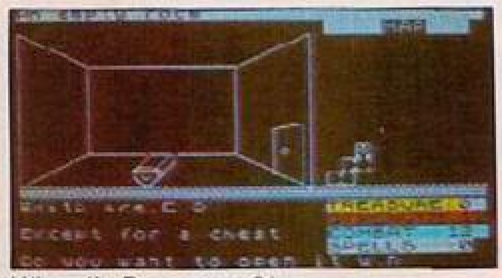
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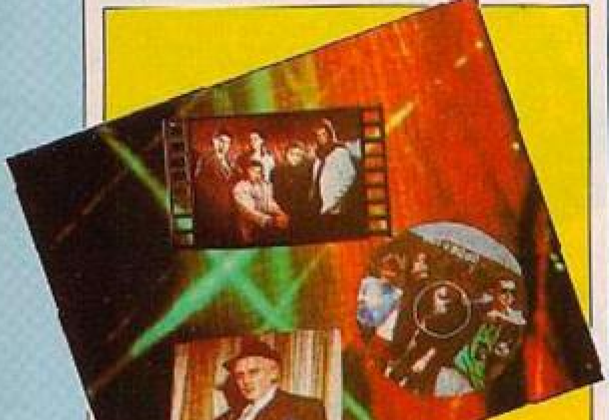
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GET SORCERY OR YOU'LL TURN INTO A FROG

"*Get Sorcery or you'll turn into a frog.*"
Well, that was the verdict of Which Micro on the Commodore 64 version. Now available on the 14th February is a greatly enhanced, stunning new version of Sorcery for the Amstrad and MSX. 40 screens of amazing and breathtaking graphics (50 in the case of the MSX version), with endless hours of tough and challenging game play.

What the press said about the "Amstrad" version:

"Amstrad owners should welcome it with open arms – it's far and away the best game I've yet seen on the micro" – Personal Computer News.

"What makes this game special is the astounding quality of the graphics" – Popular Computing Weekly

The World has fallen into the Dark Ages. The Evil Forces of the Necromancer are creeping to every last corner of the ancient land that was once the powerful domain of the Great Sorcerers. You are the last free Sorcerer, all the others have, one by one, been entrapped by the hideous evil that abounds.

So don't delay, get your copy now. It's available now from leading computer stores.

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Sorcery is available from all good retailers, however, if you cannot find it in your local shop send £8.95* inclusive of postage and packing to— Virgin Games, 2-4 Vernon Yard, 119 Portobello Road London W11. (*Price for Spectrum version £6.95)

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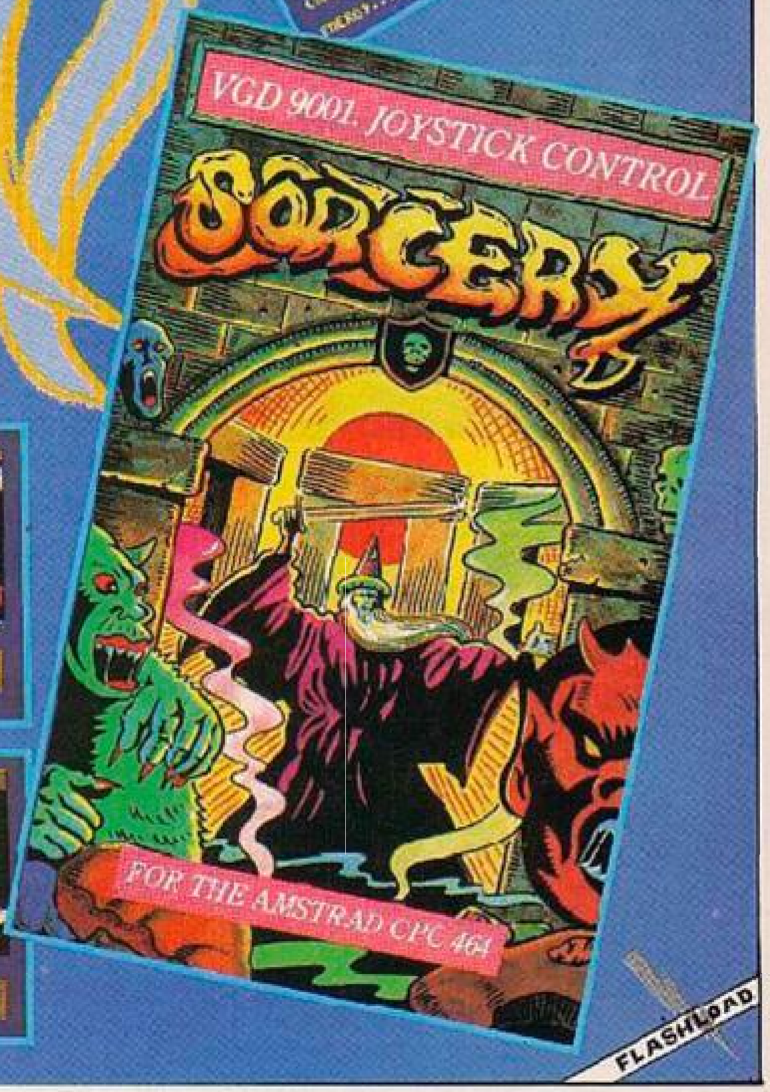

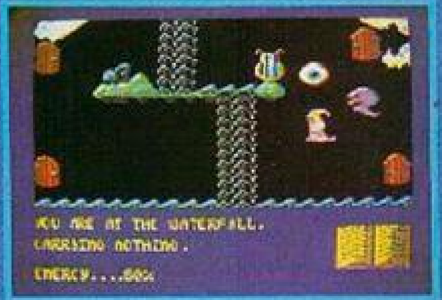

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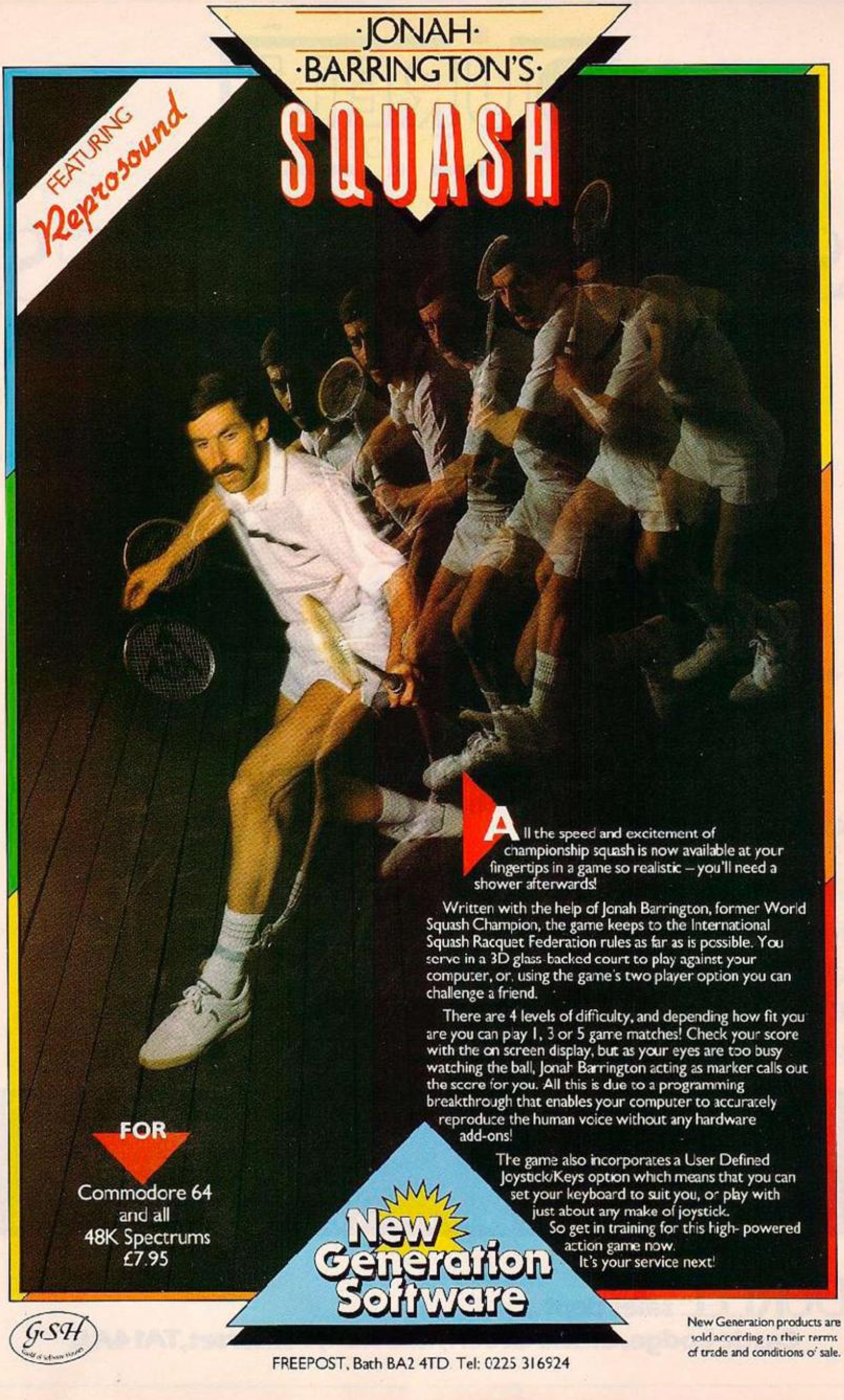

·JONAH·
·BARRINGTON'S·
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FEATURING
Reprosound
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There are 4 levels of difficulty, and depending how fit you are you can play 1, 3 or 5 game matches! Check your score with the on screen display, but as your eyes are too busy watching the ball, Jonah Barrington acting as marker calls out the score for you. All this is due to a programming breakthrough that enables your computer to accurately reproduce the human voice without any hardware add-ons!
The game also incorporates a User Defined Joystick/Keys option which means that you can set your keyboard to suit you, or play with just about any make of joystick.
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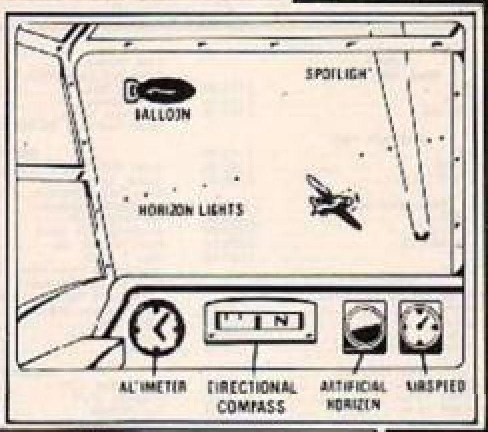

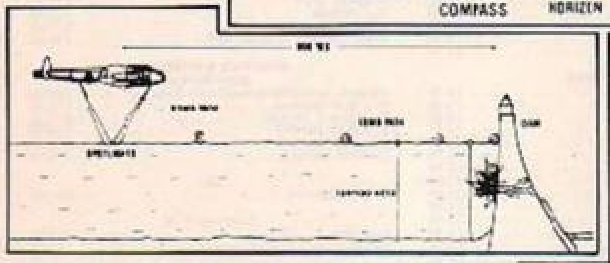

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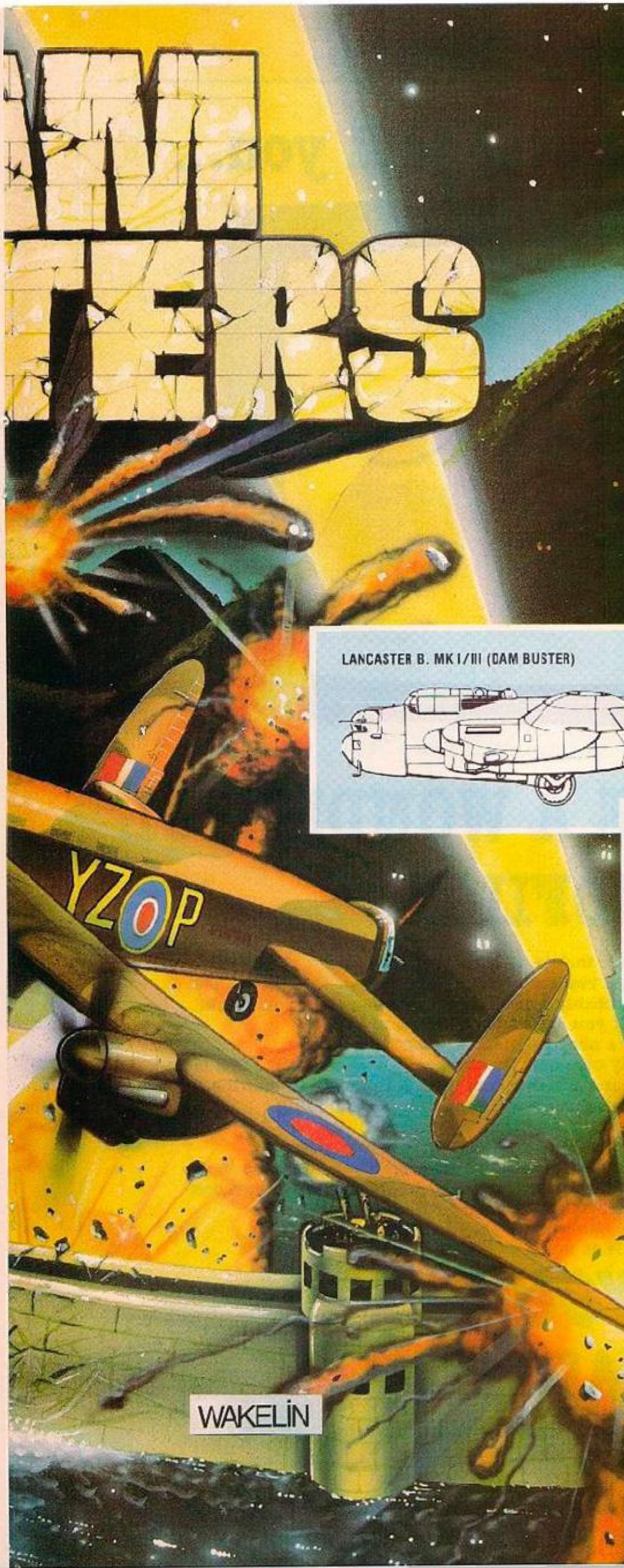

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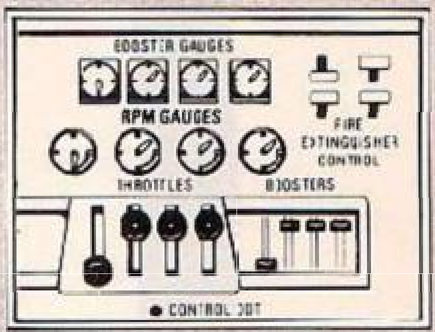

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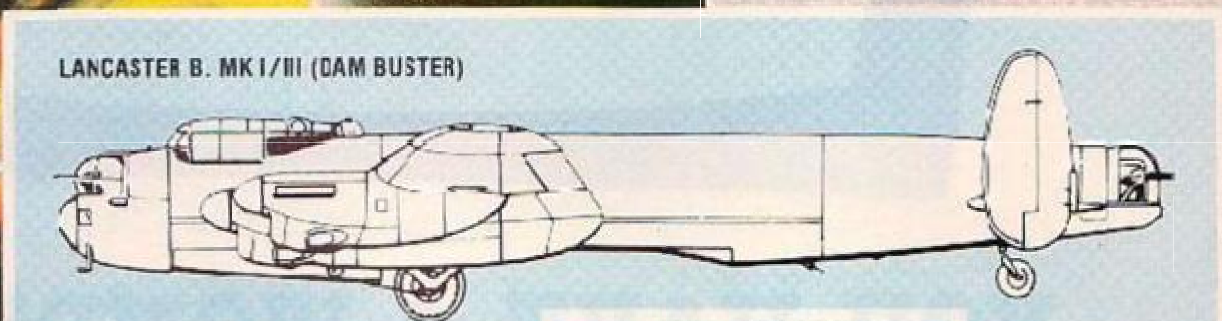

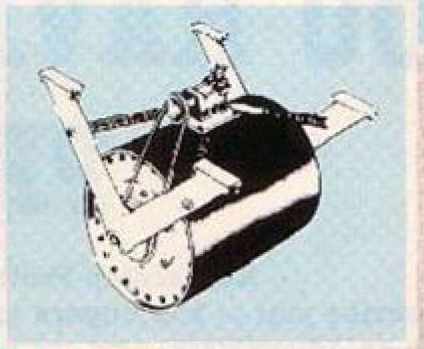

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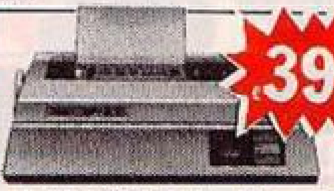

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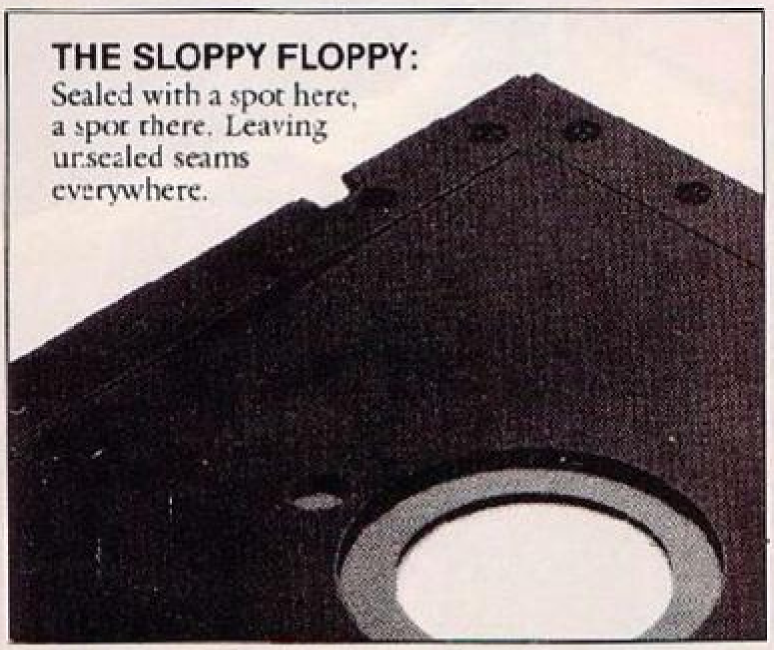

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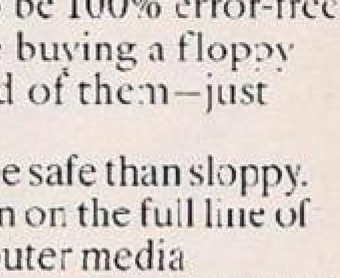

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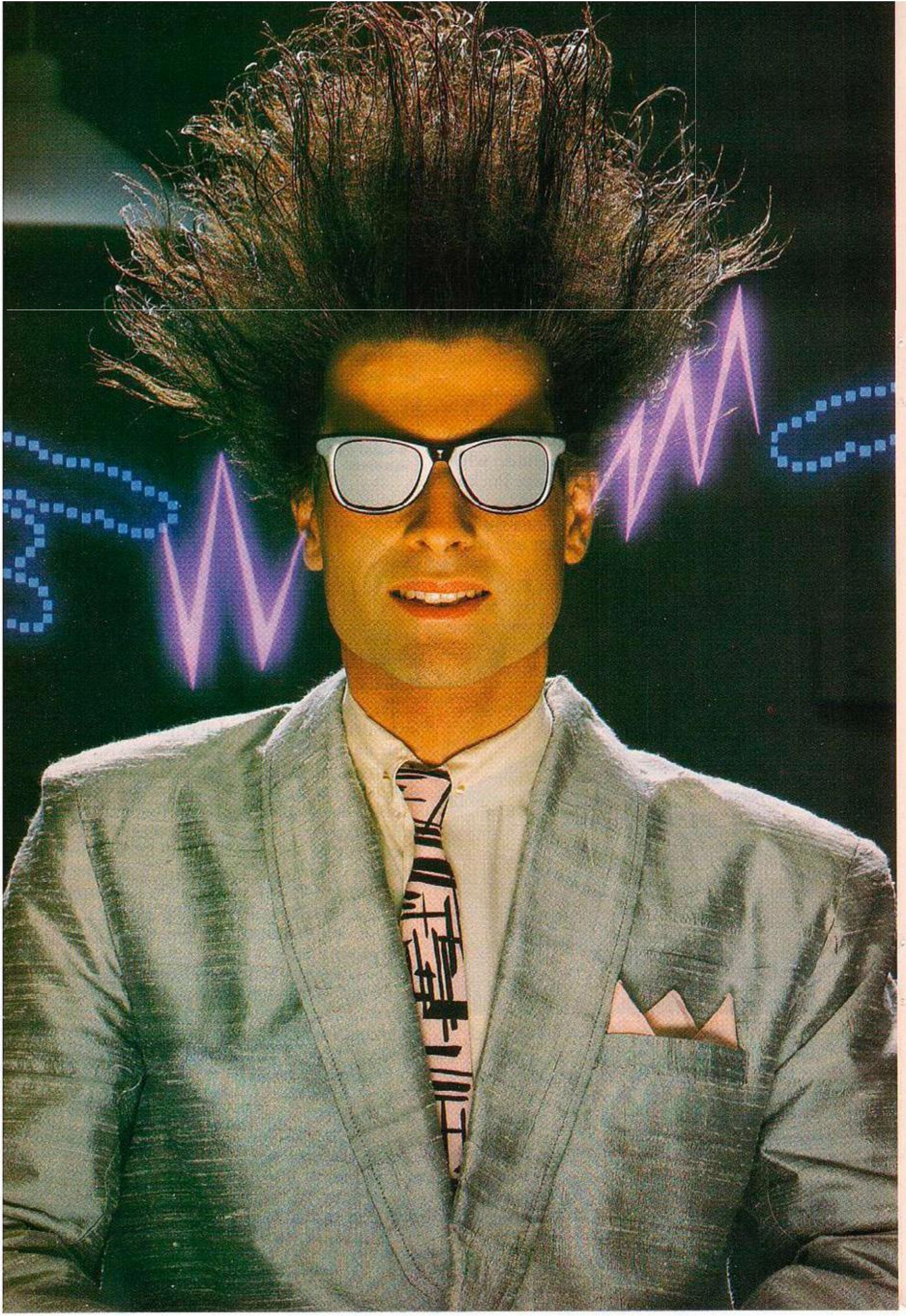

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WITH RAM CHIP prices tumbling downwards, the biggest plus for Acorn's new 64K machine is the £170 it costs more than the old BBC Model B. In 1983 when memory chips were scarce and expensive there might have been some justification for a big price hike for a computer with more Ram. But now Atari's 128K XE for £170 puts paid to the memory-equals-price myth.

Computer manufacturers pay less than £1 for a 64K-bit Ram. Take four of these and you've got 32K of memory and a little change left over. Back in 1981 the ZX-81 retailed at £70 and its 1K memory was a major production cost — a 16K Ram pack cost £50. Today micro-makers find themselves staring up at Ram mountain.

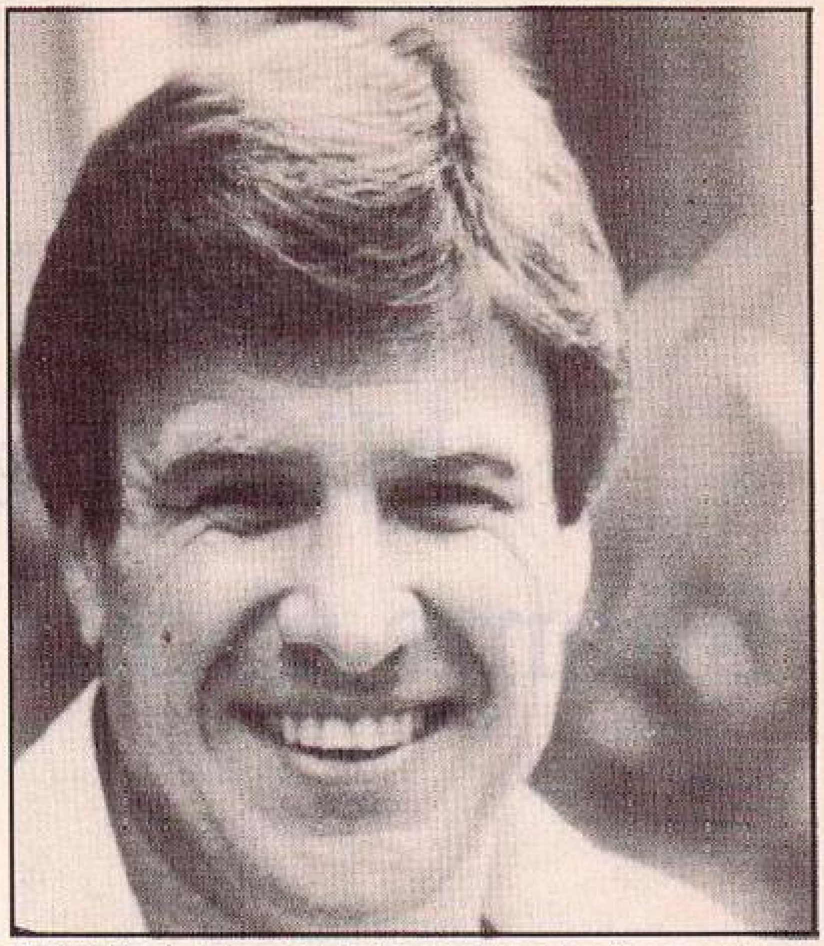
The turning point was the 1983 chip famine. Machine manufacturers over-ordered to ensure an adequate supply and then cancelled their bids as they satisfied demand. It takes time for a chip producer to ramp up production and it's difficult to scale down output precisely at the point demand peaks. The result? — over-supply and cheaper chips for everyone.

Add to that the sudden arrival of a major new source of memory chips in the Far East like Samsung and the competition hots up even further. Korean Samsung aims to put $750 million into chip manufacture over the next five years and has already spent $300 million in the last year to crank its output of memory chips up to six million 64K-bit Rams a month. Compare that with Hitachi, the biggest memory-maker at 15 million a month. It seems that Samsung has already pulled in some big customers like Sinclair, who has been using their chips since September.

But just how useful is all this extra memory to home computer owners? 64K is the most an eight-bit chip like the Z-80 or 6502 can address without resorting to bank-switching. Perhaps adventure writers will benefit from the extra space but it will take some time for software houses to capitalise on it. In any case, it is often argued that more memory just make programmers flabby — some of the best software around was written for small memories with economy in mind.

What really counts is the power of the main processor and graphics chips, and for serious applications the quality and price of storage devices.

Editor: TOBY WOLFE; **Assistant Editor:** MEIRION JONES; **Production Editor:** IAN VALLELY; **Software Editor:** SIMON BEESLEY; **Commercial Software Editor:** PAUL BOND; **Editorial Assistant:** LEE PADDON; **Editorial Secretary:** LYNN DAWSON. Editorial: 01-661 3144. **Advertisement Manager:** NICK RATNIEKS 01-661 3127; **Senior Sales Executive** JULIAN BEDLAKE 01-661 8458; **Advertisement Executives:** NIGEL BORRELL 01-661 3660 KAY FILBIN 01-661 8484; **Northern Office:** GEOFF PARKER 061 872 8861; **Advertisement Secretary:** MAXINE GILL; **Classified:** SUSAN PLATTS 01-661 3036; **Publisher:** GAVIN HOWE; **Group Advertisement Manager** SHOBHAN GAJJAR. Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. © Business Press International Ltd 1985. Printed in Great Britain for the proprietors Business Press International Ltd Quadrant House The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500, Telegrams: 892084 BIPRESG. ISSN 0263-0885. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1. Subscriptions: U.K. £12.50 for 12 issues. ABC 131,766 June-December, 1984.



Emlyn Hughes hopes micros can keep hooligans out.

STOP THE HOOLIGAN

AS THE FINAL WHISTLE blows on another troubled soccer season ex-Liverpool star Emlyn Hughes suggests micro-technology can reduce football hooliganism.

Instead of the referee's red card a white card could curb trouble on the terraces. All bona fide fans would be issued with photo cards with an identifying magnetic stripe. This would have to be passed through a reader on the turnstile connected to a micro at the ground. Convicted hooligans would be put on a mainframe central register of banned fans which would be used to update local computers each week.

But unless all football clubs agreed to join there would still be problems with away supporters and uncommitted fans. David Crofts of Sperry which is proposing the scheme in association with Emlyn admits that it would only be fool-proof if everyone was forced by law to carry an identity card.

Meanwhile our Robot Competition winner Guy Taylor has a different approach to stopping soccer hooliganism with technology — see page 67.

Cheap Tatung

TATUNG has joined the price war by chopping £150 off the 64K Einstein, which has a built-in 3in. disc drive.

Some dealers are now offering a package of an Einstein with a single drive, colour monitor and £190 of software for £500, which could make it tough competition for the new Amstrad CPC 664 which, like the Einstein, is Z-80.

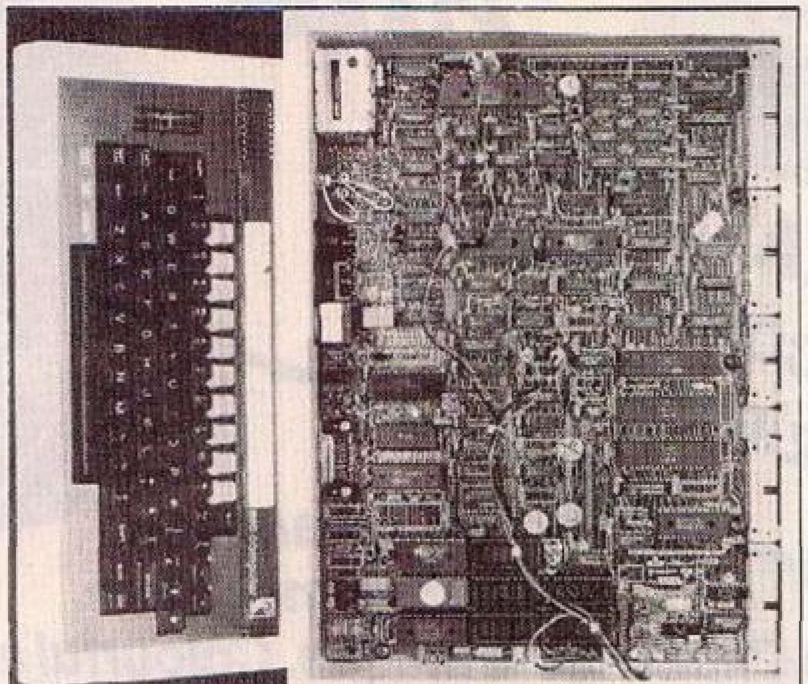
At £350 the Einstein comes with various bundles of software depending on the whims of individual suppliers. The twin drive version now costs £500 — the same as the single when it was launched last year.

D – FOR BBC B+
New Acorn is not enough

GAMES WRITERS, dealers and even Acorn enthusiasts are all giving the new B+ BBC micro a D–. Meanwhile the top man in charge of selling BBCs and Electrons, consumer director Peter O'Keefe, appears to have voted with his feet by resigning from the company as soon as the Plus was launched.

The redesigned Plus board has two extra Rom sockets, 64K Ram, with Basic and operating system combined on a single 32 kilobyte chip to make space for a built-in WD 1770 Disc Filing System — which means you can plus a drive straight in. But although the new DFS has the advantage of utilities like Verify and Format on Rom, many commercial disc-based programs are currently protected by calls to the 8271 DFS chip Acorn has used up till now and so will not run on the Plus.

Externally the Plus retains the BBC micro's case but inside the new simplified board should make it cheaper to produce than the old B, despite the improved specification. With BBC micros already looking overpriced at £330 this makes it all the more remarkable that Acorn intends to sell the Plus for £500 — when the 64K Amstrad 664 costs £50 less and includes a disc drive and colour monitor, while the Atari 130 XE has twice as much money for a third of the price. No wonder one dealer told us he was "dreading" the arrival of the BBC B Plus.



New board simplifies BBC — but not by much.

INSTANT HAIRCUTS ON 64 DIGITISER

From picture to screen by video digitiser.

CRL'S NEW VIDEO DIGITISER for the Commodore 64 could be a breakthrough on the road to realistic graphics. For around £150 the cartridge, which plugs into the back of your 64, allows you to take a picture from a video camera or recorder and present it on screen as a 160×200 pixel image, which can be stored or altered by introducing new colours or zooming in on small areas of the picture. It could be used by a hairdresser to show a picture of a customer's head and then show what different haircuts would look like on screen rather than waiting till the scissors have done their worst to find that it is not what the client wanted. CRL may use the digitiser themselves to make background effects in games more realistic and to improve animation. The digitiser comes complete with software to output images to a colour printer and is designed to be used with graphics pads like the Koala and lightpens. And if that isn't enough for CBM graphics enthusiasts, SMC is introducing a Magic Mouse sprite and icon designer for the 64 at £60.

Trading Standards clamp down on piracy

IF PIRATES think that the heat is off them until William Powell's Copyright (Computer Software) Amendment Bill becomes law, a recent case in Bath may make them think again.

Rod Evans of New Generation Software called in the Trading Standards Officers when he saw half-price versions of NGS's Knot in 3-D and Quicksilva's 3-D Ant Attack advertised for sale by Leosoft.

After several months work the TSO established that these were illegal copies made by one Antony Yarpold of Mill Hill, London and he was successfully prosecuted under the Trades Description Act.

Meanwhile, Powell's Bill is now through the House of Commons and the Federation Against Software Theft hopes that it will be law by July.

Hotline for warriors and Wallies

IT'S FOR YOU-HOO. Software houses have at last discovered the phone. Mikro-Gen is now operating a Telephone Tranquiliser Service on 0344-56447 for Everyone's a Wally fans who need desperately to know what Wilma should do when she's read the looks. In stark contrast, if you want to go nuclear in PSS's Theatre Europe, an authorisation phone call must be made first — and PSS lays on the drama before giving the code word.

Long live QL-Com

QL-COM LIVES. Despite the collapse of OEL which developed the QL-COM telecommunications package for the QL, the modules will still come to market under the name Q-Link now that Tandata has bought the rights.

NEXT GREAT ISSUE MAY 23

MICRO CHALLENGE . . . the first computer-age puzzle magazine

On sale every month at all good newsagents, price £1

No, not another computing magazine.

Micro Challenge is unique. Colourful and exciting, it's packed with intriguing puzzles — and prize competitions — devised specifically for microcomputer owners.

WIN A COLOUR TV!

TRIANGLE TANGLE

Brush up on your geometry to unravel the answer.

It is possible to find many examples of three different right-angled triangles which are all equal in area. Can you, however, find three such triangles for which every side is a whole number of units (an integer)? Try to devise a program to find the trio with the smallest possible area.

This is an example of one of the many types of puzzle to be found in Micro Challenge — but it's also your chance to win a superb JVC portable colour television with remote control. Solve the problem, using skill, judgement and your own micro, then send the solution, on one of the prize puzzle entry forms from the May/June Issues of Micro Challenge, to the address given in the magazine, marking the coupon AP1. (A proper form must be used; no photocopies or facsimiles are permitted). The competition closes first post on June 17, 1985, and the first correct entry opened wins the prize.

Moving at the speed of light you could still snap up our fabulous launch issue. Order a regular copy from your newsagent now. Details of subscriptions or postal deliveries contact:
MICRO CHALLENGE
Somers House, Linkfield Corner, Redhill, Surrey RH1 1BB

DIARY

AS I WRITE THIS, Steven Jones of Manchester is on his way to the offices of Scorpio Games World to collect another royalty cheque for his game Manic Mushrooms — or so he thinks. Waiting for him will not be Eamon Andrews and the This is Your Life team but a list of questions because Scorpio really wants to know why his game looks so much like Manic Climber — a Spectrum game by Hugh Dereli published in *Your Computer* last September. Scorpio was sceptical at first when we phoned to say that Dereli had seen Manic Mushrooms reviewed in another magazine and had his suspicions. Then we asked Scorpio to load up the game and then push 1, 2 and Caps Shift simultaneously. As the copyright sign and Dereli's name appeared on screen there was a gasp at the other end of the line followed by a promise to "do something nasty to the fellow who sent it in", then a more considered offer to pay all royalties to Dereli.

AMONGST THE LOTS at the Soft Aid auction in aid of Ethiopia at GLC County Hall, London on June 15 will be the last remaining piece of the original Imagine. Days before the most-hyped company in the history of computers crashed we were sent the inlay card of a game which never was — Cosmic Cruisers — and stapled to it the traditional bribe, in this case a packet of Smash instant potato.

FIVE OF THE WORST games ever is how James Learey of Firebird is describing Don't Buy This, the company's latest release. Instead of the usual copyright warning is an invitation to copy it if you don't mind wasting a tape.

SINCLAIR'S RECENT TV ADS which showed him jumping dozens of feet in the air may have been good for Sir Clive's ego but have done little to shift QLs which have not even been produced for the last two months because the warehouses were bulging. Now his press campaign comparing the QL with disc-drive based IBM PCs is raising eyebrows. Apparently if you ask a dealer what micro he or she would buy given up to £2,500, the answer would be a QL. We cannot find one dealer who agrees — can you? Name names Sir Clive.

Elsie Dee

HARD TIMES

Atari shows Hanover discs

THE ATARI "Power without the price" slogan takes on a new meaning as Tramiel's men still refuse to put an exact price-tag on the 10Mbyte hard disc.

But what is clear is that the disc — first seen at Germany's vast Hanover Fair mascarading in a 1050 floppy disc drive box — will trample current hard disc prices and should cost as little as £500 for around 8Mbytes' formatted storage.

Like Atari's 16-bit, 512K 520 ST, the hard disc is already out with software developers, albeit in pre-production versions. The controller board has yet to be scaled down to fit into box size.

Computer-watchers should spot the £700 ST in the shops by July — although small production runs have already started — and the hard disc should be visible a month or two later. With Atari putting all its efforts into getting the ST and peripherals including the half-megabyte 354 and 1Mbyte 314 disc drives ready to time, other products in the company range have been hit by the "delayed" kiss of death. Others have not been so lucky. While the 65XP portable and 65XEM music machine are "delayed" the 65XE, 130ST and 260ST are dead.

Not deterred by these early fatalities, Tramiel is still promising a 32-bit "Vax in a box" for the autumn, and is even talking about a Turbo 68010-based ST for the end of the year.

Open the box. Jack's lad Sam Tramiel with hard ST.

664 FOR YORKIES NOT FOR YUPPIES

CPC-664 with Yorkie man Alan Sugar.

AMSTRAD'S NEW DISC-BASED CPC 664 is only the first of a number of new Amstrads. Alan Sugar plans to release an Amstrad with a built-in modem and other variants with extra memory are likely products.

The 664 has a built-in 3 in. 180K disc drive instead of the cassette in the 464 which will continue in production at its old price. Like the 464 the 664 comes with a monitor and the whole system — computer, drive and screen — costs £339 with a monochrome display and £449 for colour. Sugar says all his products are aimed at the "average truck driver and his wife" rather than the Yuppies and technological whizzkids which seem to be some other companies' targets.

But Amstrad is also aiming the 664 at small businesses with claimed CP/M compatibility. Unfortunately the 664 has insufficient free memory to allow some CP/M classics — such as WordStar — to run in their full form. Amsoft will market its own business software some of which requires an additional £160 FD 1 disc drive.

POP★ TOPS

TOP 20

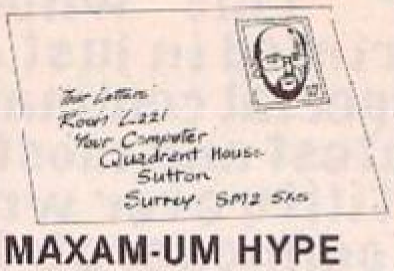
1	R.I.P.	M. Tronic	Vc
2	Rockman	M. Tronic	Vc
3	Mickey the Bricky	Firebird	Vc
1	Master of the Lamps	Activision	64
2	Baseball	Imagine	64
3	Rock 'n Bolt	Activision	64
1	Chuckie Egg II	A&F	Sp
2	Booty	Firebird	Sp
3	Gyron	Firebird	Sp
1	Wizardore	Imagine	Ec
2	Football Manager	Addictive Games	Ec
3	Mini Office	Database Pub.	Ec
1	Blue Max	US Gold	At
2	Fort Apocalypse	US Gold	At
3	Spitfire Ace	US Gold	At
1	BMX Racers	M. Tronic	16
2	Vegas Jackpot	M. Tronic	16
3	Classic Adventure	Melbourne House	16
1	Chuckie Egg	A&F	El
2	Classic Adventure	Melbourne House	El
3	Ghouls	Micrpower	El
1	Decathlon	Ocean	Am
2	Sorcery	Virgin	Am
3	Jet Set Willy	S/Projects	Am
1	Jet Set Willy	S/Projects	Ms
2	Flight Path	Anirog	Ms
3	Crazy Golf	Mr Micro	Ms

Vc = Vic-20 64 = CBM 64
Sp = Spectrum Bc = BBC At = Atari
16 = CBM 16 El = Electron
Am = Amstrad Ms = MSX

TOP 3 BY MACHINE

*	1	Dragon Torc	Hewson Con.	Sp
↑	2	Booty	Firebird	Sp
*	3	Super Gran	Tynesoft	Sp
↓	4	Everyones a Wally	Microgen	Sp
↓	5	Star Strike	Realtime	Sp
*	6	Death Star Interceptor	System 3	Sp
↓	7	Ghostbusters	Activision	Sp
↓	8	Alien 8	Ultimate	Sp
↑	9	Airwulf	Elite	Sp
↓	10	Wild Bunch	Firebird	Sp
*	11	Moon Cresta	Incentive	Sp
*	12	Shadow Fire	Beyond	64
*	13	Gyron	Firebird	Sp
↓	14	Monkey Magic	Solar	13
*	15	Brian Jacks Challenge	Martech	Sp
↑	16	Mini Office	Database Pub.	Sp
↓	17	Go Go Ghost	Firebird	64
*	18	Wizardore	Imagine	Bc
*	19	World Series Baseball	Imagine	Sp
↓	20	3D Timetrack	Anirog	13

Sp = Spectrum 64 = CBM 64 16 = C16
Bc = BBC * = New Release — = Same Position Source = WH Smith



YOUR Letters

Your Computer now has its own Prestel Mailbox. Our number is 019991800. If you have any program enquiries send us a message. We will try and give you an answer within a few days.

MAXAM-UM HYPE

I DON'T KNOW about the quality of Arnor's assembler board MAXAM, but the quality of their marketing must be pretty good if they have been able to convince you that any Amstrad owner who does not have their product cannot possibly be a "serious" user.

One thing I do know is that the quality of the cassette-based assembler I bought from Arnor some time ago leaves much to be desired. Corruption of the source-code after saving and loading is all too common, often a load of garbage being added on at the end or, more seriously, great chunks of code disappearing altogether, making the thing completely unreliable.

In any case, the suggestion that a "serious" user must have a £60 add-on to be able to program in machine-code is utter nonsense. Any programmer worth his or her salt should be quite capable of utilising Ram effectively, without need of extravagant luxuries.

If you really want to recommend a useful utilitarian product, I suggest the assembler Deep Thought, available from Ultratec (Computing), Floor B, 93 Mount Road, High Barnes, Sunderland at the rather more sensible price of £8.95. Its author Phil Murray may not be a very slick marketeer, but he strikes me as a darn good programmer.

Nick Godwin,
Eyemouth,
Berwickshire.

POKING ABOUT

I WRITE TO your regarding software protection on the Commodore 64. The following is a list of Pokes which help to prevent unlawful copying of programs.

1. To prevent the use of the Stop key:

a) POKE 808,251
b) POKE 808,239

2. To prevent a program being Restored:

POKE 808,255

This also produces a confused listing.

3. To prevent a program from being listed:

a) POKE 775,0
or b) POKE 774,131 : POKE 775,164
or c) POKE 774,226 : POKE 775,252

Part (c) produces a cold start if an attempt is made to list the program.

4. To prevent a program from being Saved.

a) POKE 818,131 : POKE 819,164
or b) POKE 818,226 : POKE 819,252

Part (b) produces a cold start if anyone tries to save the program.

5. To prevent a program from being Saved and listed:

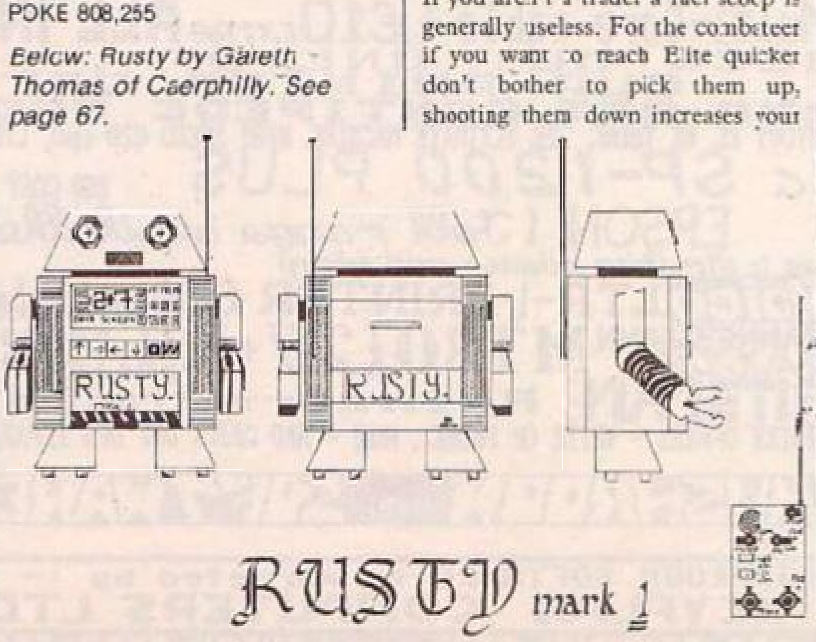
a) POKE 808,255 : POKE 818,32

6. The following Poke causes a cold start if an error occurs:

a) POKE 768,226 : POKE 769,252.

S F A Shah,
Enfield,
Middlesex.

Below: Rusty by Gareth Thomas of Caerphilly. See page 67.



CHEAP PRESTEL

FURTHER TO Robert Evans' letter — May issue — re "Prestel Warning" to modem users, I would like to point out the statistics of Prestel telephone call access. At the present time over 96 per cent of the U.K. telephone population has Prestel available at the local rate — i.e. 40p for one hour — and the remaining percentage is under review.

In all Prestel/Micronet literature it gives details and invites any potential customer to check the access rate by dialling 100 and ask for the Freefone Prestel Service.

Clair Walker,
Micronet 800.

ELITE TIPS

TO REACH Elite is a hard task as a lot of you have probably gathered by now. If you want to keep a low profile with the Galactic Police don't trade in slaves, narcotics or firearms. If you aren't a trader a fuel scoop is generally useless. For the combateer if you want to reach Elite quicker don't bother to pick them up, shooting them down increases your rating — I'm talking about the five sided Thargon Rem-craft. I just bought a fuel scoop to make my Status page look pretty. Every ship, besides cobras and vipers gives a bounty and increases rating.

Useless equipment.
Right beam/pulse laser
Rear beam/pulse laser

If you're a combateer include fuel scoops and large cargo bay on your list. Missiles near the useless point the useless point because most pirate ships and all Thargoid battle cruisers are equipped with ECM systems. Try not to make more than 3.5 to 5.2 light year jumps because every so often a whole fleet of Thargoid battle cruisers catch you while you are jumping to your already programmed world. If you manage to destroy all of 5-10 cruisers you'll have enough fuel to escape out of Witch Space.

If you have an energy bomb it's well worth the trouble to press Tab.

A list of objects which improve your rating.
Cobra mk III
Mambas
Pythons
Sidewinders
Thargoid Invasion Ships/Battle Cruisers
Thargons
Vipers
Asteroids
Missiles

If you're a fugitive you'll get frequent visits from vipers from locations 1, 2, 3 and 4. If you're an offender and are attacked by a viper patrol don't fire back. Look for pirates, shoot them down and hopefully you're offender tag will be eliminated. Using escape capsules returns your legal status to clean.

A Manxan,
Seaforth,
Liverpool.

ENTERPRISING

A SMALL bunch of Enterprise owners wish to start up an independent users group for the machine, as we feel it deserves more support than it is currently receiving.

I would be grateful to hear from any other users who are in a position to offer assistance, or simply want to join us as a member. If interested please send a SAE for full details of the club.

Mark Lisak,
10 Mansfield Road,
London NW3 2HT.

(continued on page 27)

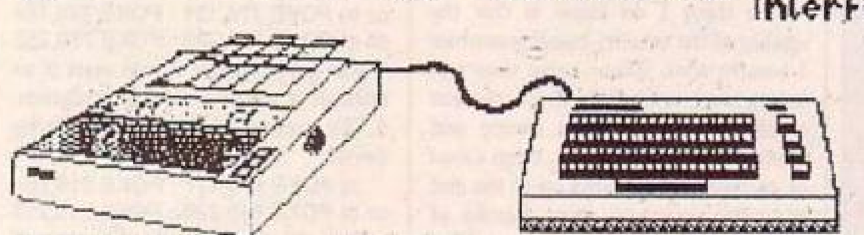
State of the Art Software

This whole page was printed in just one run, using the special commands contained in the latest and most sophisticated printer utility ever written for the Commodore 64!

NOW, YOU CAN BE THE MASTER OF YOUR PRINTER WITH,

CENTIPEDE

The Advanced commodore 64 – CENTRONICS Interface / Printer Utility



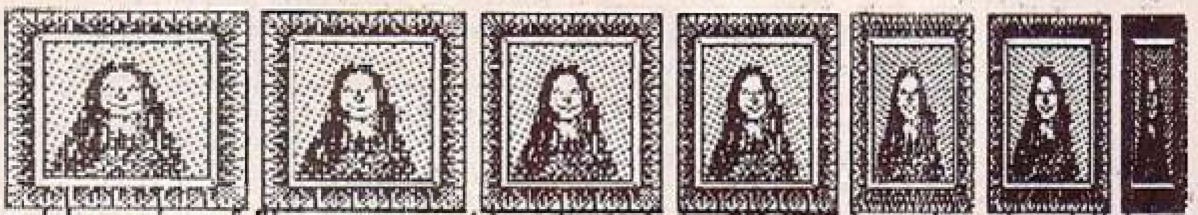
COMPATABLE HARDWARE – *CABLES*
The printer is connected to the 64 via the user port.. Pins A to # are used- (PA2 to strobe and FLG to Acknowledge. A proper shielded multi-core cable is supplied (if needed) rather than ribbon. It works fine with 'EASY SCRIPT'.

SOFTWARE – *This program is fitted a disposable Auto-Relocater which enables it to Co-exist with most other utilities. You can, if desired, specify an address on locdint. Another feature to put you in control!*

IF YOU ALREADY HAVE A CABLE – WE CAN ADVISE YOU ON ITS SUITABILITY – YOU NEED ONLY PURCHASE THE SOFTWARE.

THIS PROGRAM HAS BEEN TESTED WITH BOTH DOT MATRIX AND DAISY WHEEL TYPE PRINTERS WITH EXCELLENT RESULTS

VERSATILE *As stated at the top of the page, this whole page was printed out in just one run and not just 'stuck together' for the benefit of this advert! Proof of what is possible when using 'CENTIPEDE'. So far I have mixed Hires with the printers' own font. There's more:-*



Above.. I have taken a piece of Hires screen, and by using a simple FOR-NEXT loop, have dumped it here using each of the modes available on my printer. I even have a choice of 4 ROTATIONS! (The 4th can be for shading). The rotation can be used in both low and hi-res and, can be either a whole screen or just one character square. There are over 20 commands, and 255 secondary addresses, giving the user plenty of freedom to make his printer perform whatever tricks it was designed to. (and perhaps a few the makers hadn't thought about !).
The writer has even made some amendments to the operating system of the 64. Just to make life a little easier.
You can print.. "CBMSTYLE Control codes" Or maybe... "CBM(clr)(rvs)(yel)»» Control codes"
Or if you're just not in the mood for opening and closing files, then you can use the '**' command which does it all for you!!
Generally, the use of ESC codes has been cut to the minimum so you may enjoy using your printer to the maximum.
Of course, you can still use this utility as though the extra features didn't exist.. We don't want to change tradition ...Too much. Whichever way you want to use your printer. You'll find the way with 'CENTIPEDE'.

USE THIS UTILITY TO DUMP PICTURES FROM 'DOODLE' & 'KOALA PAD', *for just:*

£11:50 £9:50

Multi-Core cable + £10 *EXTRA* **ALL INC!**

OR CHECK OUT ONE OF OUR PRINTER OFFERS • AND GET CENTIPEDE FREE!

THE PRINTER USED FOR THIS PRINTOUT IS, WE THINK, THE ULTIMATE MACHINE. HIGH SPEED (120 cps), LTR QUALITY, OVER 70 ESC CODES.
ITS CALLED THE *Sakata* SP-1200 PLUS AND COST JUST £292 INC. CENTIPEDE & CABLE

PHONE OR WRITE FOR PRICES OF, Some other makes of printers we have to offer..(Prices inclusive – except delivery)

EPSON [*Full range available*]

Dolco LTR-1 PRINTER £160 INCLUSIVE LIMITED PERIOD LQ

MANNESMANN TALLY MT80 £217 + Full range available

RITEMAN: Printers from £249

WE HAVE MANY MORE PRINTER OFFERS – WRITE OR PHONE , NOW! – *AND CHECK OUT OUR EXPANDING SOFTWARE RANGE*

MUSHROOM SOFTWARE

MUSHROOM SOFTWARE is marketed by :-
KEYPLAN COMPUTERS LTD
193 ROMMANY ROAD, LONDON SE27 9PR
01-670 3533

IN ★ TOUCH

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page that's as it appears in the magazine and includes illustrations.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "+ + + STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

YOUR Letters

(continued from page 25)

MONITOR BUGS

Thank you for publishing my Amstrad monitor program in the April issue of Software File. Since sending you the program I have identified a bug which occurs under certain conditions. The fix for this requires the lines listed below to be changed/added.

```
34  FOR pointer = &ABB3 TO
    &ABDE:READ a:POKE
    pointer,a:NEXT
35  DATA &ed, &73, &ee, &ab,
    &d5, &c9, &00, &33, &33, &ed,
    &73, &ec, &ab
39  DATA &ea, &ab, &ed, &7b,
    &ee, &ab, &c9
330 POKE &30, &C3:POKE &31,
    &BA:POKE &32,&AE:REM set
    restart 6 ready to jump to
    breakpoint handler at &ABBA
420 CALL &ABB3, address
```

Denis F Riley,
Nuneaton,
Warwickshire.

SNAKES ALIVE

Unfortunately, the listing and article published last month for my game, Snakes Alive contained a number of errors which would have prevented most people from correctly assembling the program.

To start from the text, the two big errors are, first, that in the load instruction, for relocating the program to lower memory, which should read:

LOAD ""CODE 24000

and not

CODE 2400

You may have realised this, as 2400 is an address in the Rom, but the second mistake straight afterward is not so obvious. I said after the load instruction, to then use that to load in code previously typed from listing 2.

Unfortunately, since the magazine used its own listing and checksum method, the two large listings have been interchanged. This means that if you have not yet typed in any code, you should begin with listing 3 after listing 1, and later load in code from this listing. If you have already typed in all the code, however, it is necessary to swap around the two blocks of code. This is most easily done if you only have a 16K Spectrum, with:

LOAD ""CODE (load in your finalised code): SAVE "MOVE!" CODE 28384,4384 (save on a spare tape) : RANDOMIZE USR 0 ; and then: LOAD""CODE (the finalised code again) 28384. (this moves the first part up): LOAD""CODE 24000 (load in the previously saved MOVE!" file)

And then, resave it all with the instruction given in the article. Alternatively, if you saved both code blocks after their completion, you could simply load them in the other way around.

Next, and perhaps most important, the USR statement in the loader program is wrong. This one's my fault, I'm afraid. It should read:

USR 30066

not

USR 30069

```
340 DATA 30F-12011FFF0000070000000001AD9A010000006000 0
101239601000000000000000000000000000320000000000000200002
000000000000000000000000000000849901
0000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000004F8A0
350 DATA 0000000000000000000050F6F0000050FCF8A00050FCF0
000000000F8A0000050F6F0000005
00000FCA000005A5CA800005
45CFC0000545CFC000054AC4000054FCA800
360 DATA 0000FC000000000003000000000003000000003020000000
30300000000000000000000000000F0A000000050F6F0000050FCF8
A00050FCF0000004F8A0000
0FCAE000005A5CA8000054ACFC00
370 DATA 0054FC0C8A00054FCFC000000FCA800000003020000000013
0200000012030000000100030200000000000000000000000000000F0A0
000050F6F0000050FCF8A000
50FCF00000004F8A000000FCA800000545CAE00
380 DATA 0054ACAB000054FC0C8A00054FCFC000054FCFC000000F
CAB00000030220000000203000000120100000001000102000000000
00000000000000000F0A00004
52F0F0000CFEF0F0000458F0F000000CF0400
```

Now comes the nitty gritty; because of the denseness of the print of the main listings, there are several places where the hex code is unreadable, or has even vanished. These, if you have avoided typing them in, may be corrected by loading in the relevant listing code and the hex loader, and entering the following addresses, codes, and checksums.

Listing 2: The amazing disappearing checksums in the first two lines are 389 and 777.

29544: 02I43E0A9I07/47EB = 552
29552: 7EB638F60232A75B = 968
29560: 7EB6032630CDDB70 = II4I

Listing 3: The somewhat unreadable figures in the first 20 or so lines are mostly 4s, 1s, 7s & 0s. Only if these are correct will the checksum be correct also, so if you are unsure about a digit, use trial and error to determine the correct one.

29456: 93 IF 8F CF DF 8F 8F 9I = 1182

D R Aspinall,
Brentwood,
Essex.

CORRECTIONS

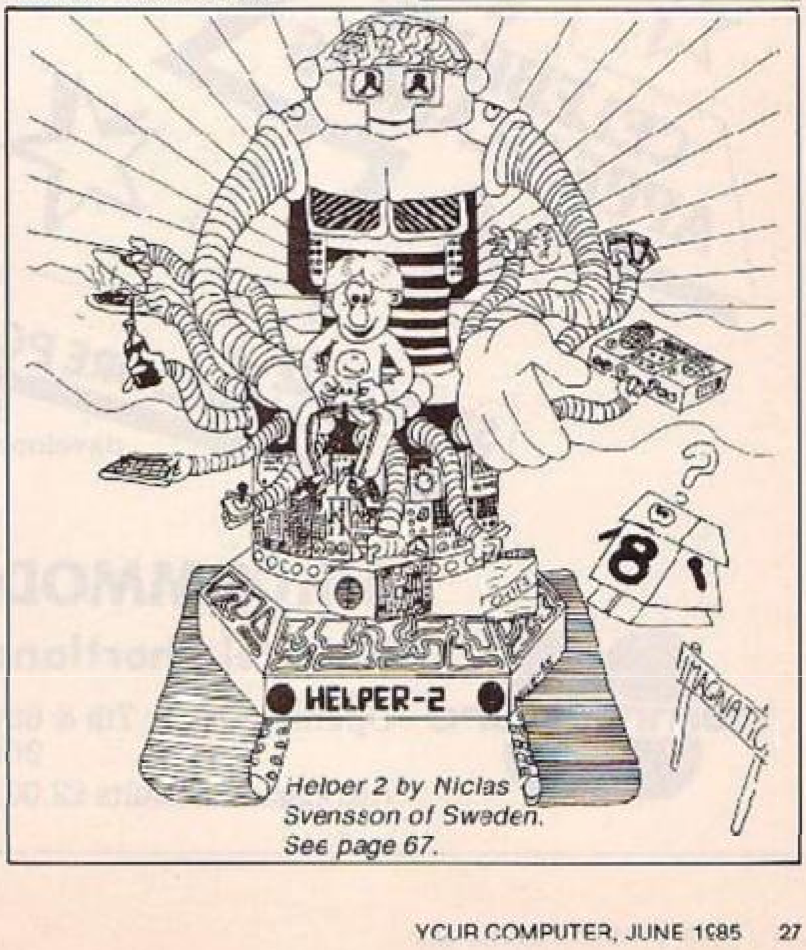
Mark Jones' Plodine program in the May issue works perfectly as it stands but by changing just five lines of code it can be speeded up substantially. To do this replace the following lines:

```
BRA.S  LPA
LSL.B  #1,D3
LSL.B  #1,D6
ROL.B  #1,D5
DBRA   DC,LPA1
```

with

```
LSL.B  DO,D3
LSL.B  DO,D6
ROL.B  DO,D5
```

Lines 340 to 380 in Listing 2 for May's Amstrad program Jumper are not clearly printed. An improved listing is given above.



Helper 2 by Niclas Svensson of Sweden. See page 67.

I could do that...

John Ransley's piece on Basic animation on page 31 should have given you a few ideas of your own. So for this month's £15 competition we would like you to write a short program — no more than 20 lines — to produce a simple animation sequence. The restrictions are that it must only use PRINT statements and alphanumeric characters — no POKES and no user-defined characters.

If you are short of inspiration just consider the ways in which films animate their title sequences. You could, for instance, have a jumble of letters troop onto the screen and then re-arrange themselves into a message or title.

April's competition was to simulate a kaleidoscope, to write a drawing program which would mirror a figure drawn in one quadrant in each of the other three quadrants. From a large number of entries we picked as the winner a Spectrum program from R. Doughty, 13 Hall Road, Stowmarket, Suffolk. As well as allowing you to draw diagonal lines and move the cursor without drawing it includes an option for erasing lines — a vital feature in any drawing program and one left out by many of the programs submitted.

```
5 REM "plotdraw"
10 LET x=100: LET y=130
15 REM movement keys 1,2,3,4,5,6,7,8. Move cursor frame only - key b. Plot - key p. erase - key e. Erase cursor frame - key c. Hold movement key down (in plot mode) to draw straight line
20 GO SUB 150
25 PAUSE 0: LET a$=INKEY$
30 IF (CODE a$<49 OR CODE a$>56) AND a$<>"e" AND a$<>"p" AND a$<>"c" AND a$<>"b" THEN GO TO 25
40 IF a$="p" THEN LET p$="p": GO TO 25
50 IF a$="b" THEN LET p$="b": GO TO 25
60 IF a$="e" THEN LET p$="e": GO TO 25
80 IF a$="c" THEN GO SUB 150: STOP
90 GO SUB 150: GO SUB 180
100 IF a$="1" AND x>3 AND y<172 THEN LET x=x-1: LET y=y+1
105 IF a$="2" AND x<253 AND y<172 THEN LET x=x+1: LET y=y+1
110 IF a$="3" AND x<253 AND y>3 THEN LET x=x+1: LET y=y-1
115 IF a$="4" AND x>3 AND y>3 THEN LET x=x-1: LET y=y-1
120 IF a$="5" AND x>3 THEN LET x=x-1
125 IF a$="6" AND y>3 THEN LET y=y-1
130 IF a$="7" AND y<172 THEN LET y=y+1
135 IF a$="8" AND x<253 THEN LET x=x+1
140 GO SUB 150: GO TO 25
150 PLOT OVER 1,x-3,y+3: DRAW OVER 1,6,0
155 PLOT OVER 1,x-3,y+3: DRAW OVER 1,0,-6
160 PLOT OVER 1,x+3,y-3: DRAW OVER 1,-6,0
165 PLOT OVER 1,x+3,y-3: DRAW OVER 1,0,6
170 RETURN
180 IF p$="p" THEN PLOT x,y: PLOT 256-x,y: PLOT 256-x,176-y: PLOT x,176-y
182 IF p$="e" THEN PLOT INVERSE 1,x,y: PLOT INVERSE 1,256-x,y: PLOT INVERSE 1,256-x,176-y: PLOT INVERSE 1,x,176-y
185 RETURN
```

BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

A bluffers' guide to micros

NAME DROPPING is a necessary activity in any social circle and the world of microcomputing is no exception. Film buffs will tell you that Douglas Trumbull did the special effects for 2001 a space odyssey and then went on to make his own movie Silent Running, throwing in the fact that he has developed a revolutionary new technical system for cinematic projection. A dedicated aficionado of popular music will know the names of at least two members of Frankie Goes To Hollywood apart from Holly Johnson.

So with the micro-buff. Any fool knows that Babbage's assistant, Lady Augusta Lovelace was the daughter of the poet Byron. Most people who went on the Turing test of artificial intelligence have taken the trouble to find out that Turing was an English mathematician and not a town in northern Italy.

It is not just that microbuffs know a lot of technical jargon. Each specific type of computernik has his or her own touchstones, his or her own idols, according to how they employ their micro. The computernik who actually uses his home micro for word processing may be able to talk freely about WordStar or Tasword and Perfect Writer even though he only uses the Quicksilva Wordprocessor on an antiquated Spectrum. A database freak will be glad to swop terms like dBaseII, DMS, FMS-80 and, of course, Superfile. Company names like Caxton, Compsoft and — if they read *Practical Computing* — Southdata will trip off their tongues. But they are hardpressed to name names; there is a facelessly bureaucratic quality about their hobby, though an astute and envious few will point out that Ashton Tate made a million out of dBaseII.

But for the computer gamester, it's a different story. Whether he's into arcade action or intellectual adventure, whether he has bloodshot staring eyes or a tendency to introduce the fact that he had a big problem with a dragon last night into an otherwise sane conversation, there is a veritable galaxy of stars inhabiting his firmament. Tony Crowther, Jeff Minter, Matthew Smith, Derek Webster, Eugene Evans, Kevin Toms: these names trip off the tongue as easily as an Arsenal supporter names the team which won the 1971 League and FA Cup double.

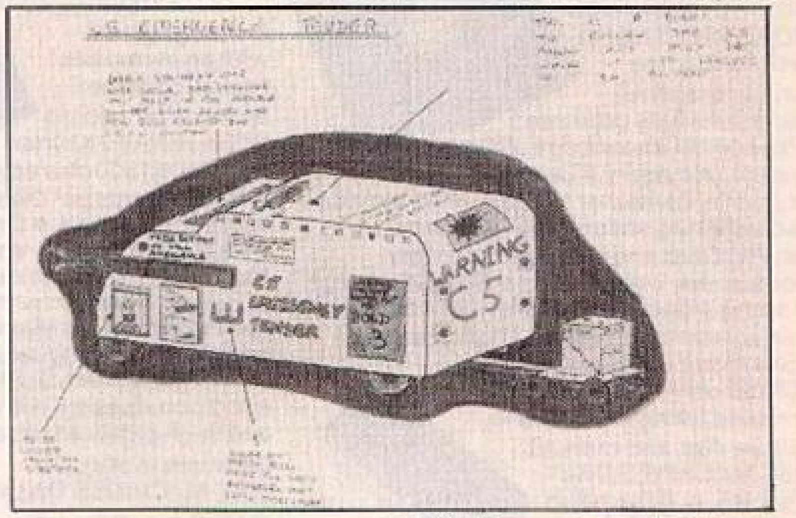
Matthew Smith got pioneer status for the late lamented Bug-Byte's Manic Miner — a game which was not only the first of its kind on the Spectrum, but which also had in-jokes about other programmers. Eugene's Lair — one of the screens in the game — was peopled by hostile toilet seats. There was even a pun on Manic Minter.

Eugene, you should know, wrote the seminal Arcadians — a straight shoot-'em-up that people with real street cred will still perversely quote as being their favourite game. The media seized on him as the ultimate whizzkid — enough money to buy a Porsche, not old enough to drive it.

Derek Webster wrote Codename MAT, the Star Raiders derivative for the Spectrum that is played practically non-stop in right-thinking computer clubs the length and breadth of this sceptred isle.

Kevin Toms created the excellent Football Manager — all the fun of failure, without the strain of being repeatedly fired.

Jeff Minter became justly famous for Gridrunner — which became top-selling game in the USA. A real achievement for a British programmer, it went to Jeff's head and he now writes games which are too fast for anyone to play, save the small faithfull colony of acolytes and llamas clustered in tents around his remote country cottage. Occasionally he emerges from retreat to say things about Tony Crowther (of Killer Watt, Blagger and Son of Blagger fame).



CS Emergency tender by Steven Bryan of Derby. *See page 67.*

If you don't feel up to comparing programming techniques, the best ploy is erudite reference to historical figures. Scott Adams of Adventure International is the man who single handedly put CAGs (computer adventure games, to you) on home micros. If the relative merits of flight simulators are being discussed you should take the opportunity to reveal that you know Bruce Artwick wrote the IBM PC flight simulator, "which has to be the yardstick by which such programs are judged." This has the double impact of (a) airing your knowledge, (b) implying that you have regular access to a rather pricy personal computer. Likewise, if military strategy games become a burning issue, you should mention that Chris Crawford really wrote the definitive program with Eastern Front. This naturally brings up the subject of Atari, founded by Nolan Bushnell with $500 he got from selling his first arcade game to Bill Nutting Associates. They didn't buy his second game, Porg, which was released in 1972 and made Atari a household word, in the States at any rate.

Paul Bond

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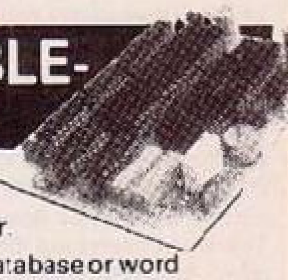

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(continued from page 29)

Doing a Disney

THE MARKETING men say that one of the most important selling features of a micro is its graphics capability. Presumably this is because buyers not only want to be sure that their choice of home computer can faithfully reproduce the pixellated nightmares of Cauldron or Combat Lynx but also want to try their hand at a few home-brewed attempts at the animator's art and games writing.

Sadly, many will quickly surrender their good intentions and return to the passive role of admiring the work of others; and this despite the comparative simplicity which user-friendly innovations such as the sprite — pioneered on the Texas TI and then refined by Commodore for the 64 and responsible for much of that machine's success.

New First Bytes isn't the place to tell you how to create the next chart-topper but we can get you started. Spare a few moments thought on the computer games and you'll reach the conclusion that they're all based more or less on the same logic. In this, Graphic A (which could be a cute moving character, a sparkling laser beam, or whatever — perhaps controlled by a joystick) shares screen space with Graphic B (which could be a static element such as a building; or an animated static element, such as an escalator; or an animated or non-animated moving element, such as a space ship). And when they touch or collide, something happens.

So let's take that universal micro truth to develop a child's counting game that uses only Print statements — thus you should be able to Run it on your micro, whatever make it is.

To start, we want to position the cursor, and thus fix the initial Print position, at the beginning of a line about half way down the screen. If you have a Commodore 64, for example, you can achieve this with the line:

```
10 PRINT [CLEAR SCREEN] TAB(255) TAB(240)
```

or if you prefer,

```
10 FOR L = 1 TO 10
20 PRINT
30 NEXT L
```

Since it's our aim first to make an astrostar move across the full width of the screen, it's necessary to signal how many moves this will take. So make M equal the number of characters your micro's display can accommodate on a line — it's probably 38 or 40:

```
40 M = 40
```

Incidentally, it doesn't matter that your program lines will jump from 10 to 40 if you chose the one-line cursor routine given above. Now set the loop to print the astrostar that many times in total:

```
50 FOR A = 1 TO M
```

Now we get to the interesting bit:

```
60 PRINT "*";
70 FOR D = 1 TO 200
80 NEXT D
90 NEXT A
```

Be sure to include the semi-colon at the end of line 60. If you now Run this demo, you'll see that a line of stars is printed the full width of your screen, with a short breather between each. Not quite animation, though. But now List the program and retype line 90 onwards as follows:

```
90 PRINT CHR$(157) " ";
100 FOR D = 1 TO 100
110 NEXT D
120 NEXT A
```

Run it to see what happens and now take another look at the listing. Every time that lines 60 to 80 are executed, they print a star and hold it on the screen for the brief period set by the delay loop. Then line 90 backspaces the cursor (I've used the all-micro standard code rather than a graphic symbol) and prints a space or blank (" ") over the star. Another brief pause, then line 120 calls for a new star to be printed at the next position along the line, when the whole process is repeated.

Experiment with different letters, figures and other keyboard characters between the quote marks in lines 60 and 90. Just for fun, delete lines 70 and 80 and 100 and 110 altogether.

This demo simply moves a single graphic — now let's try for both movement *and* animation. The following short program could be developed into something quite cute by adding a few extra lines to provide X number of turns, a final score, and maybe a snatch of music or sound effects. Its main purpose, though, is to demonstrate that simply alternating two images at the same spot on the screen — in this case, the letters O and C — is enough to create the illusion of animation:

```
10 PRINT [CLR SCREEN] TAB(255) TAB(240)
20 R = INT(RND(1)*(40-20)) + 20
30 LET M = 40
40 FOR P = 1 TO M
50 PRINT ".";
60 NEXT P
70 PRINT CHR$(145);
80 FOR A = 1 TO M
90 PRINT "O";
100 FOR D = 1 TO 100
110 NEXT D
120 PRINT CHR$(157)"C";
130 FOR D = 1 TO 100
140 NEXT D
150 PRINT CHR$(157)" ";
160 IF A = R THEN 180
170 NEXT A
180 PRINT:PRINT "MUNCHMAN GOBBLED"A"POWER PODS."
190 INPUT "HOW MANY ARE LEFT OUT OF 40";P
200 IF P=M-A THEN PRINT "YOU RE RIGHT -"P"LEFT.":GOTO 220
210 PRINT "SORRY. YOU'RE WRONG -"M-A"LEFT."
220 END
```

You'll recognise much from the earlier demo — it's just worth mentioning that line 20 is used to generate a whole number between 20 and 40 — your micro may use a slightly different syntax. In line 70, CHR$(145) is the code for cursor up.

John Barsley

BEGINNERS first bytes

Choosing a printer

CHOOSING A printer can be almost as difficult as deciding which micro to buy. There are at least three different types of printer widely available and dozens of different makes. So here is a brief guide to some of the points that should be borne in mind by the first-time buyer:

INTERFACES: If your micro has a built-in printer port then you will have no problem connecting up to a printer. Most makes of printer come with either a serial RS-232 interface or a Centronics style parallel interface, and sometimes offer a choice of each.

If you own a machine like a CBM-64 or a Spectrum which does not have a standard printer port then you would be well advised to buy an additional interface — usually a cable together with interface software on tape or Rom. Generally speaking the dedicated printers produced by manufacturers to run on their own micros are not to be recommended. Their only advantage is that they plug straight in and handle graphics characters.

Commodore printers, for example, are less flexible than other dot matrix printers in the same price range and — at least in this writer's experience — are not always reliable; while Sinclair printers give a notoriously poor quality printout.

PRINTER TYPE: At the moment the three main types are dot matrix, daisy wheel, and thermal. Daisy wheel printers use the same mechanism as electric typewriters to give a very high quality — usually termed Letter Quality — printout. Their drawbacks are that they are slow, noisy, and expensive, and generally provide only one or two different typefaces.

Dot matrix printers, by contrast, form their letters as patterns of dots in the same way that letters on screen are built up from pixels. This means that although dot matrix printers do not offer the same print quality as daisy wheels, they can provide a far greater range of print modes.

The Epson FX-80, to take an example, has 64 different print modes, such as emphasised, bold, double width, as well as graphics and user-defined character options.

Epson printers dominate the dot matrix market and so software manufacturers are more likely to configure their programs to work with Epson printers than any other make. Many of the non-Epson makes — Epson clones — offer comparable performance and are often cheaper. But it is a good idea to look out for a printer which uses the same control codes as Epson.

A further point to check if you are buying a dot matrix printer is that it has both tractor and friction paper feeds. Tractor feeds only take perforated printer paper while friction feeds allow single sheets to be used.

Thermal printers also have dot matrix mechanisms but instead of using an inked ribbon burn the letters onto heat-sensitive paper. This is their main disadvantage — the fact that they only take coated thermal paper.

COST: Just how much you are prepared to spend on a printer obviously depends on what you intend to do with it. If you are only interested in taking listings then a cheap thermal printer should fit the bill: the Alphacom printer is particularly good value while the Brother thermal printer gives a surprisingly high quality printout. Epson's new thermal printer, the P-40, also looks promising — see page 33.

If you are planning to use the printer for business purposes you will need a daisy wheel. Otherwise — for wordprocessing and suchlike — you should consider a medium-priced dot matrix printer, probably in the range £200-£300. Do not be daunted by the fact that it may cost twice the price of your micro: you can use it on a bigger machine.

Simon Beesley

BASIC LIGHTNING
WHITE LIGHTNING
MACHINE LIGHTNING
LIGHTNING STRIKES AGAIN
OASIS SOFTWARE
THREE HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE COMMODORE 64
Totally dedicated to writing very fast, video games, BASIC Lightning is a is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled.
Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.
As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.
A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.
White Lightning is a complete games writing package comprising a high level, Forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful Sprite Generator Program. Programs can even be written in a combination of Forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.
The Basic Lightning part of the package can be used to experiment quickly and easily before the Forth program is developed.
The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or inverted.
MULTI-TASKING Without doubt the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc. effortless.
The BASIC Lightning Sprite Generator Program is also included in the package.
Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts.
MACRO ASSEMBLER/ MONITOR/DISASSEMBLER This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.
BASIC LIGHTNING BASIC Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.
SPRITE GENERATOR Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.
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Address
Telephone

ADD-ON EXTRA

DMP 105

Printer
Tandy
£170

The dot matrix printer has friction or tractor feed, Centronics and RS-232 interfaces. Two small DIP switches. The switches control which interface is currently active and the speed of the RS-232 interface — 2400 or 600 Baud only.

Characters are printed on a 9 by 7 matrix in expanded, normal, elite and condensed fonts, both bold (except expanded) and/or underlined. Graphics are 800 dots per line, or a coarse graphics mode.

The printer has a very good optimising function, there appears to be little wasted motion as the head takes the shortest route to print the next line.

The working print speed was better than competitive 80cps printers and as quick as some 100cps printers.

Formula 1

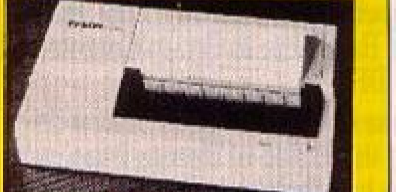
Joystick
Kempston
£16.95

Fashioned from rigid blue plastic, this looks like the sort of solid joystick you need if you are an arcade or decathalon fan. Four micro-switches, plus two for the fire buttons gives it a good positive feel.

P40

Printer
Epson
£95

A thermal dot matrix printer with RS-232 or Centronics interface, 80 characters per line at up to 45cps; mains or rechargeable battery powered with four character sets and graphics image mode under software control. It comes with an operations and inter-connections guide as well as sample programs and should be suitable for most home computers.



Epson P40.

HARDWARE hitlist

Quick Data Drive

- *CBM 64*
- *Dean Electronics*
- *£99.99*

YOU CAN always spot a Commodore owner. He's a patient sort of chap. Both disc drive and cassette have got a reputation for being on the lethargic side. From the same stable that brought Spectrum owners the Rotronics Wafadrive, Dean has adapted the technology to the Commodore. It is a single drive unit which simply plugs into the cassette port.

The system is booted up by inserting the system wafer, pressing Shift/Run, and then pressing a red button on the drive. This loads in a short program at normal cassette speed which then auto runs, setting up the wafer system. It also loads a number of utilities into the Ram behind the Kernel, so all the C64's user Ram is available. After this initialisation, all the usual cassette commands control the drive.

The operating system is perhaps the drive's weak point. There are commands for transferring programs from wafer to cassette to disc or to a second wafer drive, but there are no commands, rename or backup files. Random access files are not supported. An advanced operating system correcting these shortcomings is said to be under development and should be available as a software upgrade in three to four months.

However, the data drive does score over the Commodore drive in a number of ways: it is cheaper, it is quicker, and for software houses, the wafers offer a greater degree of protection due to the two speed system.

Quick Data Drive.

Sound Sampler

- *Spectrum 48K*
- *Datel Electronics*
- *£49.95*

WHAT DO YOU do with your Spectrum when you've finally got fed up with the mindblowing tedium of blasting little green splodges into oblivion? Rather than consign the thing to the back of the wardrobe, you might like to turn it into a powerful musical effects machine.

Until now, digital sound samplers have been the province of rock millionaires with nothing better to do than sample the particularly satisfying crunch you get when smashing a TV tube. Well, now you too can join in this fun hobby.

What Datel's little gadget does is store sound input from a microphone or your hi-fi and allow you to mess around with it, the results are really quite amazing. You do also need an amplifier to output the sound from the unit.

With the hardware, which clips onto the expansion socket, you get a tape with four effects programs on it and three sheets of clear and concise instructions.

The first program goes through the first principles of sampling and playback. There are effects such as echo, chopping and reversing. You can vary the time of the echo up to over a second.

The second program turns the Spectrum into a keyboard, the note you play modulating the sound you have sampled. The method of changing octave is somewhat clumsy, but it is an effective sample. The real meat is in the third program which allows you to compose a tune of up to 1,000 notes and rests, each with selectable length and pitch over four octaves.

Assuming you've got a Stradavarius handy, all you have to do is play one note into the mike, write a little tune and Yehudi Menuhin wouldn't know the difference.

Sound Sampler.

Spitfire
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DISK £12.95/CASSETTE £9.95

Star★chart

KEY

★★★★★ Best of its type
★★★★ Very good
★★★ Good
★★ Average
★ Below par

Grandmaster

C-16
Chess
Audiogenic
£8.95
★★★

Give any grandmaster the brain of a C-16 and he'll soon find his game suffering. Audiogenic's Grandmaster program is no exception. The C-16 version plays a far weaker game than the CBM-64's but it's still good sound chess, with 10 levels, a crisp display and a limited take-back facility.

Pinball Wizard

Amstrad CPC-464
CP Software
Arcade
£8.95
★★★

From the people who brought you Superchess, Backgammon and Bridge Player. While this may not compare with David's Midnight Magic from Ariolasoft for the CBM-64, it is nevertheless an enjoyable game.

Choice of five speeds and the excellent ball movement make this a realistic and colourful simulation of the old arcade favourite.

Talisman

Spectrum
Games Workshop
Boardgame
£8.95
★★

An adaption of the hit boardgame of the same name, this computerised version suffers in comparison. In the course of this graphics adventure you confront various monsters, collect objects, find followers and face various tests, either on your own or in competition with other players, either human or computer-controlled. A little short on explanation as well.

SOFTWARE Shortlist

Revs

- *BBC*
- *Race game*
- *Acornsoft*
- *£14.95 (£17.65 disc)*

★★★★★

OK, so Pole Position is a damn good game, but it's not really racing is it? Things improved a bit with Software Invasion's 3D Grand Prix, but Acornsoft has set itself the imposing task of simulating a formula three racing car.

There are seven controls, accelerator, brake, steering, and gear up and down. The space bar amplifies the action of the steering. It can also be controlled by joystick, which is probably much easier. First disappointment is that the brake is very hard to get at, and you can't redefine the keys. On screen you have a cockpit view of the road ahead. The screen display is good, the graphics smooth.

There are two main indicators in front of you, rev counter and gear indicator. There are also rear view mirrors. To start off with, you can do a practice, with no other cars around, just to get used to the feel of the controls. After you've got used to that you can go into competition.

Right, after practice the drivers are lined up in order of times obtained in practice. Several players can take part, practising in turn and then taking part in the race one after another. So how does she handle? Well, unless you've

Revs

ever driven a Formula three car, realism is hard to assess, but the game is certainly a great test of skill.

If you are not to consign yourself to the back of the field or to the track side catch netting, then every corner must be right. Hours of practice pay off here, the approach speed, braking, gear changes, the exact time you turn into the corner. The difference between success and disaster is very small. The 20 other drivers vary from the amateur through to the excellent and passing most of them requires skill and patience.

This game deserves as big a following as Elite. Not for the faint hearted, it demands total concentration at all times. Real pit stops might have been nice, perhaps some better scenery — except you haven't got time to look at the scenery. If you ever make the winners' rostrum, you'll have earned the champers.

Lee Paddon

Spy Hunter

- *Spectrum 48K*
- *Shoot-em-up*
- *US Gold*
- *£7.95*

★★★★

IF YOU'VE seen this one in the arcades, you'll need no encouragement from me. A fast and furious race game, with the narrow road ahead teeming with enemy agents bent on your destruction. Only your agility, driving and good shooting will save you, your country and probably civilisation.

On the roads there are three types of enemy car which must be dealt with in different ways: shooting up innocent bystanders is frowned upon, but good fun. On the water, there are no daytrippers, but the rocks, torpedoes and barrels will keep you busy. There is even a helicopter to contend with. Tricky if you haven't got your missile loaded up yet. You start off with just a machine gun, but missiles, smoke cannisters and oil pods can be acquired by entering the weapons truck.

The controls are easy to use, with steering, accelerator and brake. Weapons are fired by a combination of stick and fire button to control which weapon is fired.

Lee Paddon

Spy Hunter.

Blagger Goes to Hollywood

- *CBM-64*
- *Alligata*
- *Arcade adventure*
- *£9.95*

★★★★

THE POWER of bluff may have influenced Alligata in the naming of this program— there is a band and there will soon be a computer game with a similar name. But with its 3-D graphics, four-way scrolling and clever sound track, the new release in Alligata's Blagger series swiftly shrugs off any accusations of "passing off".

Blagger's plan is to steal a march on the competition by getting hold of the rushes of Steven Spielbum's next blockbuster. But first he has to get across 12 hostile film sets, each with the appropriate sound track.

Paul Bond

Drop Zone.

Drop Zone

- *Atari*
- *US Gold*
- *Defenderesque*
- *£14.95*

★★★★

DEFENDER-FREAKS will swoon when they see Drop Zone by Archer Maclean of Arena Graphics. It has even smoother scrolling, faster action, more vivid sound and the kind of pyrotechnics that get Guy Fawkes turning in his grave. It also has an amazing attract screen and a scintillating high score routine. Underneath it's the same old wonderful/boring (delete according to taste) Defender, but never mind the scenario, look at the scenery!

Instead of the quick scribble of landscape in Defender, Drop Zone takes place against a realistic, 3-D lunar landscape. And when you get killed, the explosions are like a

(continued on page 37)

Star chart

Sinclair QL Assembler

QL
Assembler
Sinclair
£39.95
★★★

The Sinclair QL Assembler comprises of an editor and assembler, a set of QDOS library files, pocket sized manual and a blank Microdrive cartridge — for a back up copy. The editor is the standard Metacompco editor, this runs as a separate job from the GST Assembler. The assembler shows all the standard directives and on completion of one assembly allows you to assemble another file.

Mighty Magus

Spectrum
Arcade adventure
Quicksilva
£6.95
★★★

Magus Delvin is too into matters cosmic to deal with Fraugy the Dragon, who is biting the knights, scrambling the damsels and pillaging the villages. So you, his humble acolyte must penetrate the fire-breather's lair and slay him in his place of power. And get out again.

Zapp

CPC-464
Z-80 assembler
Hewson Consultants
£14.95
★★★

Zapp is not an arcade game, despite the name, but a cassette-based Z-80 Assembly Programming Package dedicated to the Amstrad CPC-464.

Together with an assembler the package contains an editor, a breakpoint monitor, a disassembler, a hex editor and a cassette file manager. The Zapp assembler recognises all the standard Z-80 instruction mnemonics — with one exception — and the monitor displays instructions in disassembled and hex form, together with the address and the register values before the instruction is performed.

(continued from page 35)

firework display. Judge by appearances and this is one of the very best games there is.

Of course, the action is not quite the same as Defender. Instead of piloting a space-ship, you are a Jetpac type lunanaut. The Landers have turned into detailed satellites called Planters. They don't carry off your "men" — these are little blue balls instead of matchsticks — they drop pink Anti-men on them. It's fatal when they meet.

You don't just protect your men, you collect and roll them into a protective hangar.

One neat addition is that you can make yourself invisible, in which condition you become a black shape against the black sky — and if you fly low, you appear as a black cut-out.

There are some new enemies too, including storm clouds or Blunderstorms, which can destroy you with theatrical lighting bolts.

Jack Schofield

SOFTWARE Shortlist

The Hitchhiker's Guide to the Galaxy.

The Hitchhiker's Guide to the Galaxy

- *Atari 800*
- *Softsel*
- *Adventure*
- *£32.95*

★★★★★

WHO AM I: You are Arthur Dent, a character in The Hitchhiker's Guide to the Galaxy — you know, the adventure game of the TV series of the book of the radio series of the original idea by Douglas Adams. Of course, you won't always be Arthur Dent, but shouldn't you be worrying about something else? The world is going to end in 12 minutes.

INVENTORY: OK, keep your dressing gown on! You have a nice box with a colourful glossy manual attached, a double-side game disc (one only, so look after it), a reference card for the particular machine you're using — Hm, Atari, eh? Well, they're all the same in text mode — a destruction order for your house (in English), a destruction order for your planet (is that Vogon?), a small packet of fluff, an Official Microscopic Space Fleet, some peril-sensitive sunglasses — completely opaque black card.

LOOK. Well, you've got an American micro and a disc drive and a screen. This is text only, so you've got to read, ok? No pretty pictures. In the top right-hand corner there's your score and the number of moves you've taken. A "move" means you've typed something in that I understand, and I've gone to the disc and fetched a reply.

Are you sure you want to play this game?

Of course you do. It's obscure, cranky, deliberately misleading, incredibly verbose and often genuinely funny.

Jack Schofield

Super Pipeline II.

Super Pipeline II

- *CBM-64*
- *Plumbing Game*
- *Taskset*
- *£8.90*

★★★

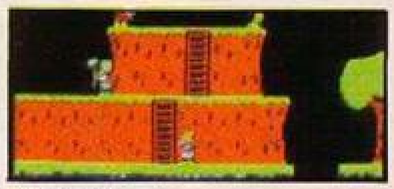
PATROLLING A pipeline fixing leaks may not sound like a promising basis for a game but Super Pipeline II turns out to be highly playable with a frantic and frenetic quality all of its own. You may recall from Super Pipeline I that the game casts you in the role of Foreman; while you cannot mend leaks yourself you can direct a workman to a trouble spot and shoot down the pests that harass him while he hammers the pipeline back into shape. Your aim is to keep the water flowing.

This sequel could be described as more of the same but also bigger and better than the original. There is an extra workman, more pests, 16 screens, and some entertaining cartoon sequences to round off each screen. When you complete Screen 1 a character in a Sinclair C5 drives along the bottom of the screen, jumps out, and then reduces the vehicle to a heap of plastic.

On top of this the game sports one of the best displays of animated machine parts.

It is coping with creatures at the same time as tending to yet another leak that makes the game so maddeningly frustrating.

Simon Beesley



Wizadore.

Grand National.

Wizadore

- *BBC*
- *Imagine*
- *Arcade adventure*
- *£7.95*

★★★

DESPITE THE the tawdry old scenario — red dragon Smaun, the Golden Sword was smote, dark evil spread its wings etc. etc. — this is a pretty, and pretty good, game.

As the last of the Arch Mages you have to enter the castle of Wizadore and reclaim your inheritance by finding the 'three spells of destruction'.

Peter Connor

Grand National

- *ZX Spectrum*
- *Simulation*
- *Elite*
- *£6.95*

★★★

THE OPENING screen gives you the runners — you can page through a field of 40 horses.

Then you can choose which horse you want to ride — and here comes the interactive bit, you control your mount by using the Z and X keys to move him left and right, whipping him on with the O key and jumping using the P key.

Paul Bond

Star chart

Elite

C64
Shoot-em-up
Firebird
£14.95
★ ★ ★ ★ ★

A game that needs no introduction. Perhaps the most successful game ever for the BBC, with an estimated 25 per cent of Beeb owners buying a copy — the other 75 per cent copied it off their mates. If it gets that sort of take up from C-64 owners, which it richly deserves, Firebird might be able to buy out B.T., and Acornsoft will be as sick as the proverbial parrot.

In case you've been on another planet, the game is all about flying around zapping aliens, doing a little haggling for commodities and new gismo's for your ship. Brilliant on the Beeb, it's even better on the Commodore with music — the Blue Danube á là 2001 when docking, Trumbles — which are cute little furry creatures — and the whole game is in memory at the same time. The controls also seem easier to handle.

Execution

Amstrad
Hangman
Datacom
£8.95
★ ★ ★

Hi-tech Hangman, but with words like capsicum, karabiner, yean and xenolith, this one had us scurrying for our dictionaries. Various levels of difficulty and help, but if you don't get it right, the gradually assembling squad of Imperial stormtroopers will vaporise you. Gnocchi, we of course guessed.

Gauntlet

Amstrad
Arcade
Micropower
£9.95
★ ★ ★

Gauntlet and Killer Gorilla — two for the price of one. A sensible approach to the Amstrad retread syndrome, this double-decker provides competent Defender and Kong-style games.

(continued from page 37)

SOFTWARE Shortlist

Starion

- *Spectrum 48K*
- *Melbourne House*
- *Shoot-em-up*
- *£7.95*
- ★ ★ ★ ★ ★

THIS GAME should have been subtitled "Crossword Solvers From Outer Space — They Came, They Saw, They Filled in Five Down!" The baddies invented time travel before you did, and have done their best to mess up space / time using anagrams (gasp)! But don't let this faintly absurd plot put you off, beneath all this lies a superb space shoot-em-up.

In a bid to forestall the conversion of Elite to the Spectrum, Melbourne House have come out of their well-worn adventure rut and shown us what vector graphics on the Spectrum are all about. What the aliens lack in tactical gumption, they make up for in firepower. Hurtling towards enemy ships, laser blazing, dodging the missiles whistling past your ship, and then pulverising them into oblivion. When you blow a ship away, it drops a letter, which you have to pick up by driving into it.

When you've destroyed all the ships in that zone, you get a break from the frantic action when you try to unscramble the letters to form a word fitting a clue from one of the time zones in the block. You then have to fly through a time gate, which looks suspiciously like an Elite

Starion.

spacestation, to the correct time zone. Do this 243 times (only) and you earn the ultimate acolade of becoming the Creator. It would take some game to make me do anything 243 times, but this just might be the one.

The various objects, ships, planets, missiles and letters all spin round, move toward, away and around your ship. The controls are comprehensive and responsive, the display moves very rapidly and smoothly. You have an instrument panel which shows the relationship to you of the various objects in the zone as well as speed, fuel, and "lives" left.

Although it might not have the depth that Elite promises, the graphics are going to be difficult to top. So if you really can't wait for vector graphics, or you like anagrams and crosswords then you could do far worse for the modest price.

Lee Paddon

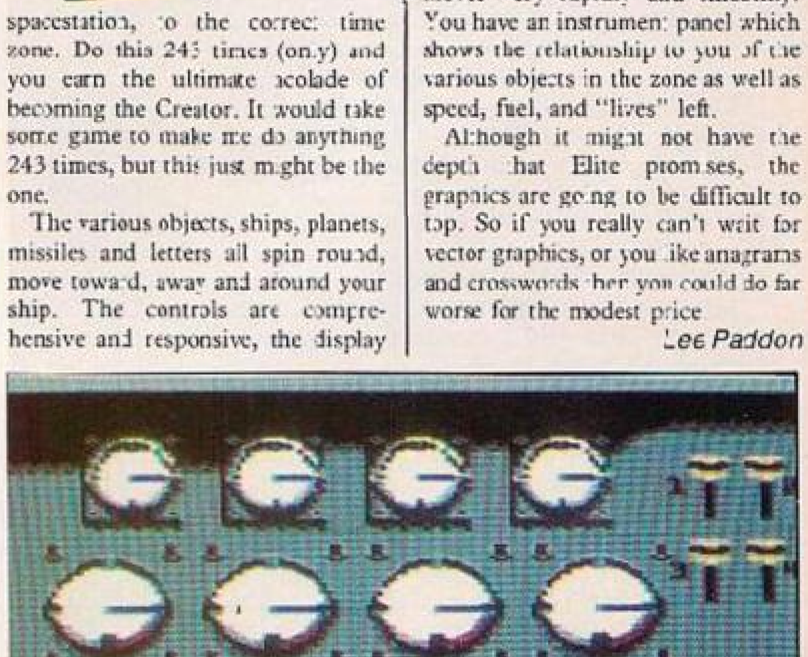
Dambusters

- *CBM-64*
- *US Gold*
- *Flight Simulator*
- *£9.95/(£14.95 disc)*
- ★ ★ ★ ★

WITH THE silence of the still summer night broken only by the steady throbbing of the powerful avro engines, you steer your Lanc onto a steady course, destination, the Ruhr Valley. Not content with just flying the thing in this simulation, you have to drop the bomb, navigate, fire two guns and keep an eye on the engines.

Instead of the familiar pattern of warfare, that of long hours of monotony followed by a few seconds of shear terror, what you get is continuous frantic action. The game is a superb simulation with nice graphics on seven screens, one for each crew member location. But is it actually playable? Is doing seven things at once just too much to ask of anyone?

There are three different games: a practice bomb run, the full game, and a short cut which has you already in the air. Opposition comes in the form of flak, night fighters, barrage balloons and searchlights. Basically the tip is fly high and dive late as you turn to make your approach over the lake towards the dam itself. Navigating is easy, your navigator makes the course which the pilot follows using a mark on his compass. That's about all the advice I really

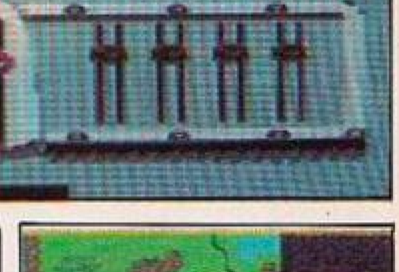


Dambusters.

have to offer and I'm probably unfit to even offer that. Having written off several squadrons of bombers, I have no more than glimpsed the dam, and by that time had a bomber that was held together with a wing and a prayer. Having made your bomb run, and dropped your "dustbin", a graphic of your bomb skipping along is shown and, with a bit of luck, a dam with a rather large hole in it. If unlucky, you will get a diagnosis of what was wrong.

Demanding, realistic, good graphics and sound, everything you could want from a simulator, except perhaps being able to finish it would be nice. Helps if you have at least six pairs of hands.

Lee Paddon



Arnhem.

Arnhem

- *Spectrum 48K*
- *CCS*
- *Wargame*
- *£8.95*
- ★ ★ ★ ★

"I THINK YOU might be going a bridge too far" were the prophetic

(continued on page 41)

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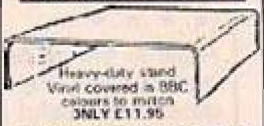
BBC MONITOR STAND



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Star★chart

Sheep Dog Trial

BBC Micro
Educational
Jacaranda Wiley
£14.95
★ ★

Two players have to get their sheepdogs to herd five sheep into a pen.

You can use your dog tactically to split up the other herd. Claims to develop logical thinking, use of grid references, forward planning.

Enjoyable, but an ordinary chess game would do the job as well and cheaper.

Nicotine Nightmare

ZX Spectrum
Anti-smoking
Atlantis
£2.99
★ ★ ★

Should deter dad from blowing smoke all over you when you're trying to use the Spectrum.

First you have to put out six cigarettes, then you have to find your way into the evil cigarette factory and stop them making the little gaspers.

Graphics are a little primitive, but not bad value for the price of two packets of fags.

Super Huey

Commodore 64
Flight simulator
Audiogenic
£8.95
★ ★ ★ ★

Yes, I know we reviewed this last month and we never review programs twice, but we felt you should know you can get the identical Cosmi game at three pounds less than the one in the US Gold cover.

Seems Cosmi gave US Gold and Audiogenic non-exclusive licences. Seems like Ocean Software and Centasoft distributors who own US Gold, not to mention All-American, UK Gold and Eurogold, plus the Imagine title, are trying to push prices rather higher than they need be.

(continued from page 39)
words of Eisenhower when General Montgomery revealed his audacious plan for a quick end to the war in 1944 by caputuring three bridges over the last major river obstacles between his army and the heart of the German Reich.

Arnhem seeks to recreate this battle through five different scenarios. Some cover just a part of the battle, and once you've mastered these, you go on to the whole thing, fighting the whole battle. As this can take up to eight hours, you, and probably your Spectrum will be glad of the load/save option.

The level of simulation is brigade/battalion level and there are 13 different unit types, each with different strengths and weaknesses. The sideways scrolling map depicts the area from the XXX corps front line near Eindhoven to Arnhem.

The system used sets a new standard for realism in wargame simulations. Units can dig in, get in to column for road movement, they have morale as well as variable strength and effectiveness. It stimulates beautifully the difficulties both sides faced in trying to deploy their forces effectively in the difficult Dutch countryside.

The XXX corps advance had to be made up a single road, where even light resistance caused delay. Meanwhile the Germans were attempting to recapture the bridges from the lightly armed paratroopers before XXX corp arrived.

There are a few minor quibbles — supply was very important in this battle, both for the airborne and ground troops; no attempt is made to simulate this. Also the system only allows you to attack once per turn, but in the other half of the turn you can move normally but not attack!

These minor points aside, this is probably the best wargame on the Spectrum to date.

Lee Paddon

Chucky Egg 2

■ *Spectrum*
■ *A&F*
■ *Arcade adventure*
■ *£6.90*
★ ★ ★

It was too much to expect really. How could anyone come with an idea as simple, as funny, as infuriatingly addictive as Chucky Egg? A&F have wisely chosen to depart from the formula of their classic game in its successor.

Chucky Egg 2 is more in the mould of the arcade adventure, even though it features the same hero — Hen House Harry — and another eggy plot. This time Harry's job is to help get chocolate eggs made.

He must collect the ingredients, put them in the vat and then find the components of the toys that go inside the eggs. Once an egg's finished he has to send it on to despatch.

Before he can enter the factory he has to get past a huge and slavering red dog. A bone comes in useful. Once inside, the first screen — of 120 — presents the problem of getting through a room in which deadly spiders are bouncing up and down on their heads.

Then it's on to a maze full of birdies, a stomping boot that seems just a little too familiar from other games of this ilk, mixtures of ladders and platforms, and so on.

There isn't too much to surprise you in the way of gameplay, but it's all very well designed and it's certainly not an easy game to crack.

I don't think anybody's going to play this game for three weeks non-stop in order to get a high-score of 10 billion, but it's good fun and has lots of tricky puzzles to crack.

Peter Connor

Chucky Egg 2.

SOFTWARE Shortlist

Talladega.

Talladega

■ *CBM-64*
■ *Audiogenic*
■ *Car racing*
■ *£8.95*
★ ★ ★ ★

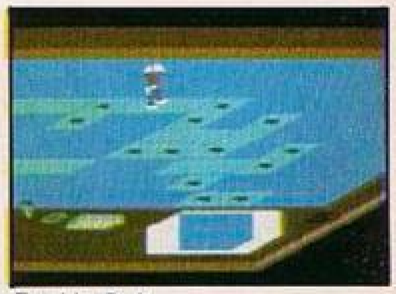
The smell of burnt rubber, the shriek of metal on metal. No, not an overheating Spectrum but Talladega, probably the best car-racing game on the market. As you hit the first bend of the race proper you realise that this program leaves Atarisoft's Pole Position standing on the grid.

Despite Talladega's scrolling landscape Pole Position may still have the better graphics but Audiogenic's race-track action is far more authentic, exciting and complex. Instead of the other cars in the race being no more than obstacles between you and a fast time, in Talladega they are out to win. Rival drivers will do anything to balk you.

Each car can be identified by its colour or race number and each seems to drive in its own particular way. Number 43 likes to race from the front, number 11 is fond of burning you off with turbo overdrive, while the white car spends most of its time slamming on its brakes just in front of you.

As you scream round the standard or random circuits of 30 laps vital information flashes up on the screen above your view of the track. You must pay close attention to the fuel and tyre-wear gauges, as well as speed, lap time, race position, lap number and the closest car in front if you are to time your pit stops correctly. Slipstreaming saves fuel, the turbo boost wastes it if mistimed.

Toby Wolpe



Rock'n Bolt.

Rock'n Bolt

■ *CBM-64*
■ *Activision*
■ *Chinese puzzle*
■ *£10.99*
★ ★ ★

Construction time again. The game is a little reminiscent of CAD/CAM Warrior, but not so boring. Your little man appears on a lift at the base of the screen and has to hop across the slanted three-dimensional display bolting together horizontally sliding slabs of metal. A blueprint is displayed at the bottom right-hand side of the screen, and you have to match your work to this.

Paul Bond

CUB AND QL– THE PERFECT PARTNERSHIP

This Cub colour monitor is TOTALLY compatible with the Sinclair QL.

It combines outstanding graphics capabilities with the facility for displaying full 85 column text whilst doing full justice to the colour potential of the QL. Its new cabinet with Tilt and Swivel Plinth harmonises perfectly with the QL's simple yet functional appearance.

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Tube Resolution (pixels) – 653 (H)

Pitch – 0.43 mm

Bandwidth – 18 MHz

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NEWS
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The crystal ball

Steve Jackson is perhaps best known as one of the two authors — Ian Livingstone is the other — of Penguin's top-selling Fighting Fantasy game books. Steve co-authored Warlock of Firetop Mountain and wrote Citadel of Chaos to name but two.

Now Steve has teamed up with Adventure International to bring us a new series of computer games entitled Swordmaster.

Games Workshop's superb Tower of Despair is now available for the Commodore 64 — £8.95 — as well as the Spectrum — £7.95. The sequel, Tower II — The Key of Hope, should have been released for the Spectrum — £7.95 — by the time you read this.

Duckworth's have published a new text adventure for the Amstrad — Colossal Cave Adventure by Peter Gerrard.

A helping hand

Martin Scanlan of Newcastle-On-Tyne has been having a little difficulty with 1942 MISSION from CCS. Having landed, he cannot shake off the parachute. Here's how:

ETUH CARA PPOR DNEH TETU HCAR APEV OMER

Level 9's Emerald Isle has been a huge success so it was inevitable that many pleas for help would soon be heard throughout the land. Here's a trio of tips:

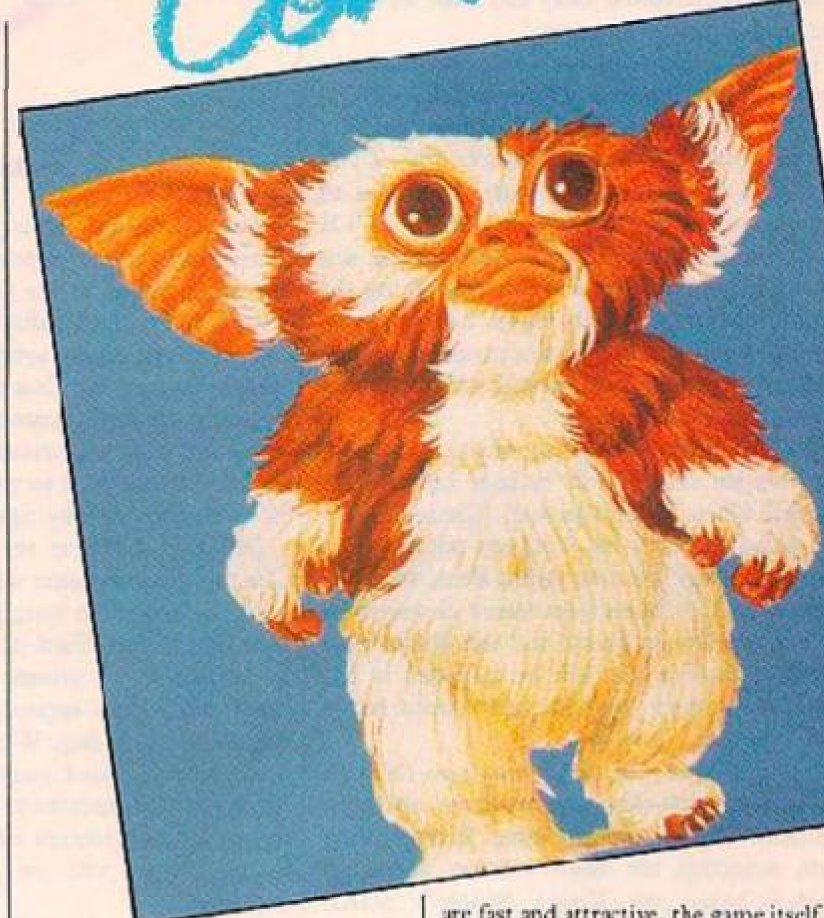
How do I remove the plank?
REMM AHEH THIT WTIN ETSAF NU

What do I do with the clock?
YEKL LAMSE HTHT IWTI DNIW

Where is the small key?
REDL UCBE HTEN IVAX E

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



Gremlins

■ *Various*
■ *£9.95-£7.95 text only versions*
■ *Adventure International*

THERE WERE three warnings . . .

"Keep them out of light, especially sunlight.

"Don't ever get them wet. Keep them away from water.

"But the most important thing, the thing you must never forget . . . no matter how much they cry, no matter how much they beg, never, never feed them after midnight."

If you've seen the film or read the book, those wise words should be instantly recognised as referring to the dreaded Gremlins. Film and TV tie-ins are all the rage at the moment and Gremlins The Adventure is one of the best I've seen. It stays faithful to the original film while managing to stand as an excellent game in it's own right.

Like all A.I. adventures, this is a text adventure with added instantaneous hi-res graphics. The pictures are superb throughout. Be warned, though — not all versions contain the graphics. Those that do are the Commodore 64, Spectrum and Amstrad while the Commodore 16, BBC and Electron versions are text only, due to memory limitations.

As in the main part of the film, a town has been overrun by gremlins. It's your job to track down and get rid of every one of them. If you've seen the film, you should find many of the solutions to the puzzles coming easier to mind than those who haven't — remember the microwave oven and food blender? — Yuk!

Just getting going is not too easy since you begin the adventure in a room with a vicious, dart-throwing gremlin. How can you grab the flashlight while being peppered with lethal darts? And where has Gizmo got to?

The graphics are superb and often very funny — pay an early visit to Dorry's Tavern, go right up to the bar and you'll see what I mean. Gremlins should be a sure-fire winner for Adventure International and deservedly so.

Dead at the Controls

■ *48K Spectrum*
■ *Artic Computing*
■ *£6.95*

DEAD AT THE controls is a new text and graphics adventure from a company whose earlier adventures have proved popular. Sad to have to report that although the graphics in this one are fast and attractive, the game itself is pretty boring.

The top half of the screen is used for an impressive graphic illustration of the current location. Beneath this is a one line description of the place together with a list of objects that can be seen — they don't appear in the picture — and the possible exits from the location. Your input and the program's responses appear below this. The character set has been redesigned and looks quite attractive.

When you enter the same location or subsequent locations, the picture is suppressed but can be recalled by typing "look". It has to be said that many of the graphic illustrations are similar.

Although the graphics are colourful and the program has a fast response, the rest of the game is dull.

Castle Dracula

■ *Amstrad*
■ *Duckworth*
■ *£7.95*

ANY TEXT adventure for the Amstrad is worthy of attention since there are so few about. This one features good old Count Drac and has plenty of tongue-in-cheek — or should that be teeth-in-neck — humour.

The plot concerns your attempts to serve up the Count with a stake. There are plenty of puzzles and locations to get your teeth into. Good fun.

SEEN IT, READ IT, HI

SPIN-O

007

"WE SPENT ABOUT two or three weeks getting into Frankie Goes To Hollywood, trying to sort out what was hype and what was real, what we could throw away and what we could use in the computer game."

Denton Designs' Ally Noble describes the approach she and her colleagues John Gibson and Karen Davies adopted when they got together with Ocean Software and ZTT, Frankie's production company, to create an arcade strategy adventure based on the FGTH album *The Pleasure Dome.* And sorting out what's hype and what's real is something the home computer software buyer has had to do more and more as companies produce not just films of books, or soundtracks of movies but computer games as well.

Spin-off games assaulting, or due to assault, your senses this month include (apart from Frankie Goes To Hollywood) Minder featuring Arfur the loveable Cockney rogue, and a game based on the new James Bond movie *A View to a Kill.* More pop music connections here, since Duran Duran did the soundtrack. Some of their music will be included in the game, along with John Barry's famous James Bond theme.

A three-parter, the 007 game from Domark features arcade sequences based on action in the film. There is a maze-chase through City Hall, a section set down a mine, and a sequence based on Roger Moore's search through Paris for Grace Jones. There will be plenty of people to play the game of the film in this particular case since Domark will be producing versions not just for the Spectrum, CBM-64 and Amstrad CPC-464 but also MSX, IBM and Apple versions — together with an Enterprise version.

Implementation for a wide range of machines makes sense if a spin-off program is to be successful. You are not appealing to the closed orders of the computer gamer where games are famous in their own right, perhaps even dictating the purchase of a particular machine. The spin-off should reach a broad church, but without incurring the scorn of hard-core computer users.

Activision's Ghostbusters would seem to have succeeded admirably in this respect; even gamers who express doubt about what actually goes on in the game usually show admiration for the quality of the graphics and the excellent music synthesis. This game appeared first on the Commodore 64 in the UK — and generated slipstream sales on the Spectrum for which a version was released later. Would it have done so well if its premiere had been on the squeaky Spectrum?

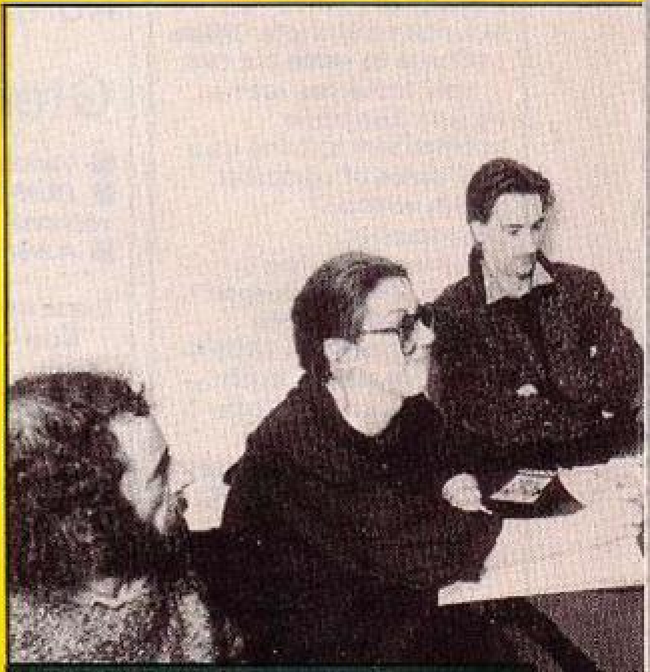
Opinions differ as to marketing strategies. Ocean's Frankie game will probably be released in its Spectrum form first, although Ocean supremo David Ward is of the opinion that it is preferable to release all versions simultaneously — this means you only have to do one lot of marketing. While both versions will feature synthesised music, the feeble sound facility of the Spectrum will be compensated for by audio remixes of Frankie songs that Ocean hope will be exclusive to their cassettes.

Frankie say when a character is born he acquires at once such an independence, even of his own author, that he can be imagined by everyone in many other situations where the author never dreamed of placing him. Huh? Well, once Paul Morley of ZTT realised what computers could do, he, Ocean and Denton Designs set out to create a game that was in harmony with Frankie's "creative concept".

"He wanted us to emphasise the essential mundaneness of life — but contrast that with the fact that there are many ways of escaping it," said John Gibson, one of the several ex-Imagine refugees that make up Denton Designs. Only as a completely fulfilled individual can you enter the Pleasure Dome. Until then, you're just a shadow.

The central character in the game is the

Duran Duran.



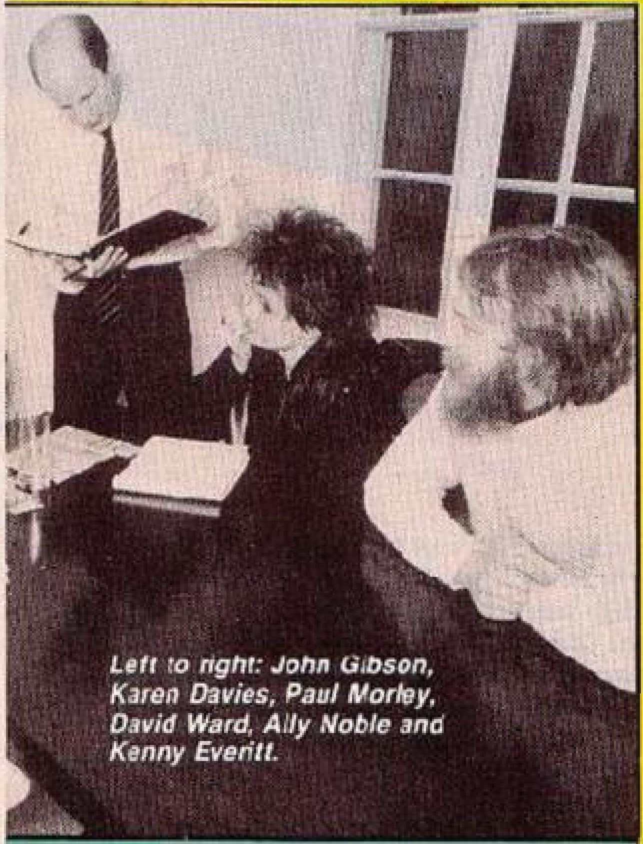
Frankie looks down on the Wirral peninsula.

Mundane . . . or is it?

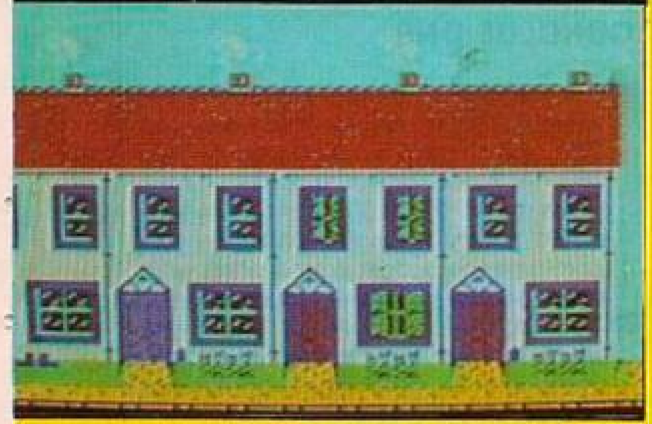
EARD IT, PLAYED IT

FFS

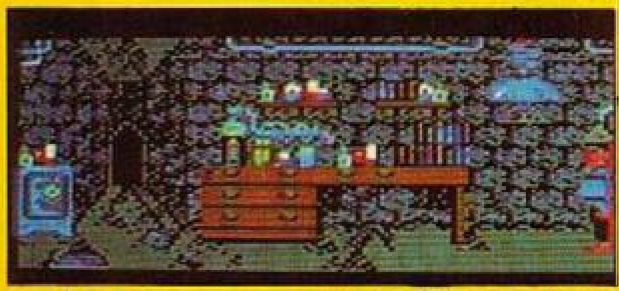
Paul Bond meets the people behind the game of the band and gets a hard sell from Arthur Daley.



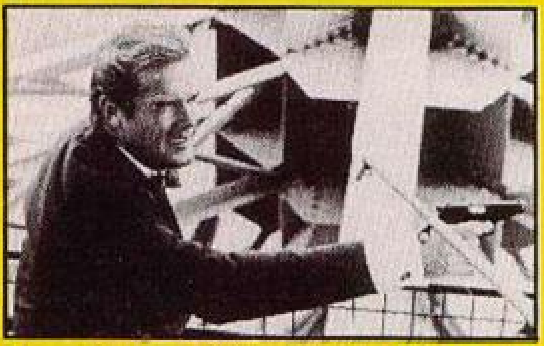
Left to right: John Gibson, Karen Davies, Paul Morley, David Ward, Ally Noble and Kenny Everitt.



What's behind the facade?



There are many ways into the Pleasure Dome



Roger Moore as 007 in his latest Bond film A View to a Kill — or should that be A View to a Quick Killing?

Frankie goes back to Liverpool in the latest spin-off computer game.

Frankie emblem, the figure clutching a star on the back of your Two Tribes twelve-incher. He enters an average street composed of four houses. Even the most ordinary facade can conceal strange goings on. Inside you will find a hall with three doors — you see, there are many routes by which one can enter the Pleasure Dome. The further you progress into the game the more connecting routes between screens are built up. Part of the game involves a murder mystery — you discover someone who is dead, but smiling. Maybe it's just a Duran Duran fan.

Whether you're in the mundane kitchen or mundane sitting room, you can change all this by following your pleasure motive. Touch the TV and the screen engulfs you. Great use is made of "windows" in this game — a touched object enlarges to allow you to examine it more closely, say, the title on a book.

Like Frankie the game tries hard to be all things to all people, so the complex web of the adventure is knitted together by arcade sequences like "The Power of Zap" in which hitting a bouncing diamond will pitch you into a variety of different scenarios.

All the sequences force you to use the joystick in different ways, at least on the 64 version. Wacky ideas include a sequence in which you have to defend Liverpool's art galleries from bombers and, another sequence, Karen Davies' pet project based on a classical painting. You mutate into a devil, enter the painting and steal all the cherubs' halos. Reagan and Thatcher make their appearances too — "We weren't consciously influenced by *Spitting Image*, but maybe subconsciously" — and the climax of the game is described as controversial but not offensive.

Denton Designs have worked hard to produce a game that stands in its own right, with or without the Frankie sticker on it. "We think pop fans will buy this game and enjoy it, but we've aimed it at computer people," says programmer John Gibson. With its innovative mix of ideas and excellent graphics, this game should prove a nice little earner for Ocean.

Would you buy a flood damaged sink from this man? Arthur Daley, alias George Cole, cleans up.

Which brings us unsubtly to the case of Mr Arthur Daley and DK'tronics Minder computer game. As with Frankie Goes To Hollywood, there was a "creative concept" to be wrestled with. "There are two approaches to any program", says programmer Don Priestley, "IBWCBD or IBWMBD — it bloody well can't be done, or it bloody well must be done." But how to computerise slang, patter, bluffs, facial expression, plots on the border of credibility?

In the computer game Minder available initially on the Spectrum, you step into Arthur's shoes, with £2,000 in your mitts and two weeks to make as much cash as possible. You also have a small selection of goods to sell — so I suppose you could characterise this as a kind of strategic trading game. The four main scenarios are the Winchester Club where Arthur does all his trading and keeps his ear to the ground, Terry's flat, Arthur's lock-up and various dealer's premises.

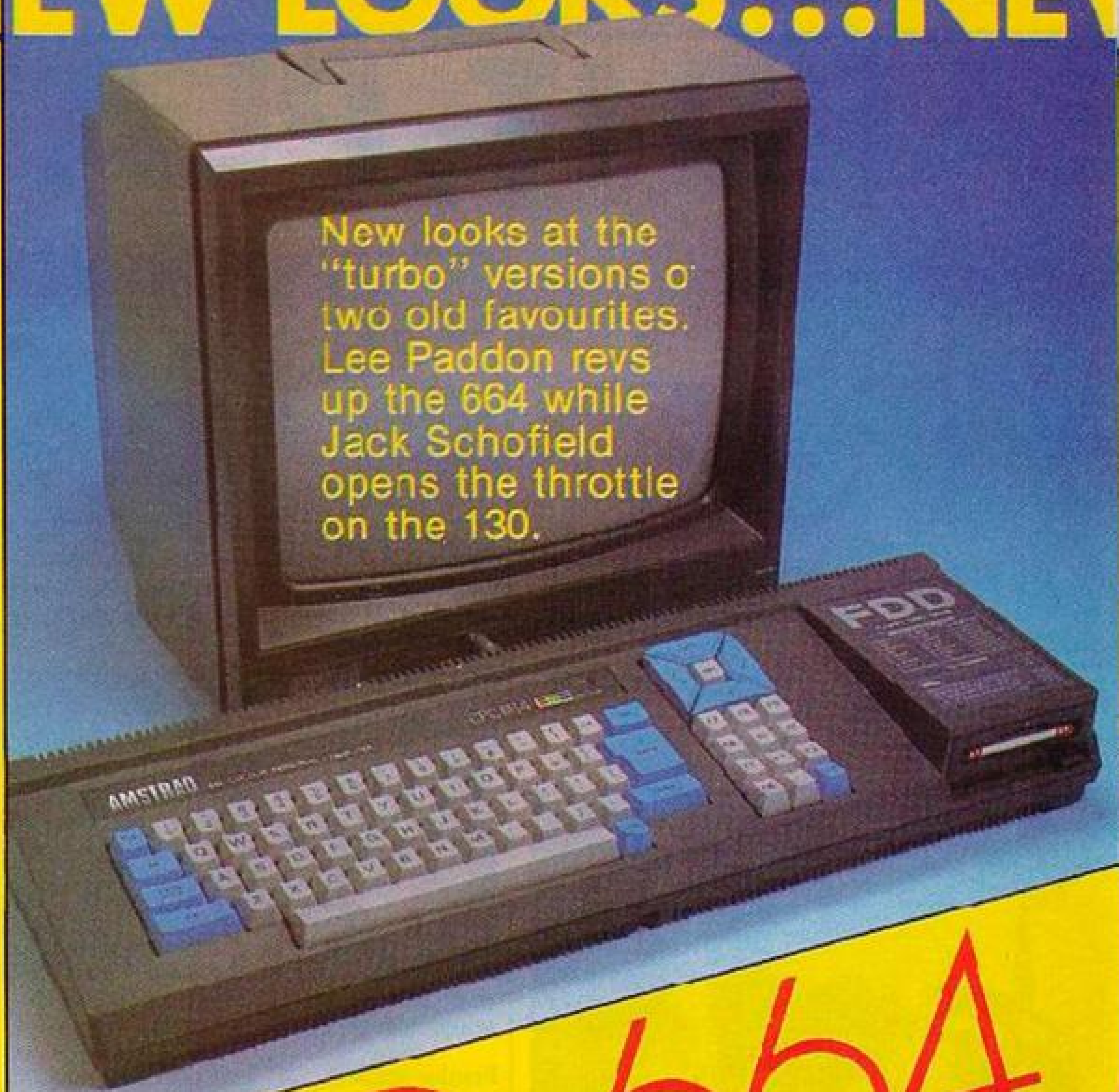
Talking to characters in the Winchester Club is simulated by a rogues gallery of head and shoulders portraits hanging up around the bar. You press the number of the one you want to talk to or sometimes they make the first approach. What they say appears at the bottom of the screen and their lips move.

The programs parser — which interprets your commands — is very user-friendly and accepts pretty wide variations of entry, things like "I'm asking a pony!" when you are hinting how much you want to pay.

George Cole, who portrays Arthur in the TV series, was there to launch the game. He has something of a vested interest in micros or at least he's invested a lot in his son Toby's Commodore 64. "He uses it to look at the Ladbroke's Telebetting page on Prestel" grins George. And Toby's favourite game — bearing in mind he hasn't had a chance to play Minder yet? Well, it's another spin-off: Ghostbusters.

...NEW LOOKS...NEW

AMSTRAD 664



New looks at the "turbo" versions of two old favourites. Lee Paddon revs up the 664 while Jack Schofield opens the throttle on the 130.

AMSTRAD IS ONE of the few success stories in the computer scene at the moment. With no overstocking problems, it has remained aloof from the recent vicious price war. So it is in confident mood that Amstrad has revealed its follow-up to the CPC-464: the 664.

The new machine is hardly a radical departure from the 464. The most obvious difference is the replacement of the built-in cassette by a disc drive. The keyboard has also been revised, and the Rom upgraded.

The disc drive is a single-sided 3in.drive with 150K capacity per side. A few commands are available as Basic extensions, all the tape commands operate the drive, other utilities — backup, format and so on — are available from within the CP/M operating system, which can be used instead of AMSDOS.

Cassette interface retained

There is a slot in the back for a second drive — either 3in. or 5.25. The cassette interface is retained, which now uses an external domestic tape deck via a Dragon style lead.

The keyboard has a new grey and blue livery, but more importantly, it has been redesigned so that the keys are in steps, which will do much to endear it to typists. The cursor keys have also changed to an MSX style cluster, which helps when editing and playing games which often use these keys.

Some useful information on ink colours and key numbers has been printed on top of the drive housing. The new Rom, which proudly announces itself as version 1.1 of Locomotive Basic, has a few extra commands. Perhaps most significant of these is the Fill command. This simply fills the area around the graphics cursor bounded by any series of lines, with the current ink colour. The Frame command synchronises updating screen graphics with the sync pulse. This produces smoother graphics, and simply replaces the widely used system call which did the same job on the 464.

Further improvements in graphics come in the form of the Mask command. This allows the user to draw either the traditional solid line or a series of dots. From this idea stems the need for a graphics paper command to determine the colour of the dots missed out by the Mask command. A new optional parameter determines the way that lines drawn on the screen interact with lines already there.

The machine's error handling system is completed with the Derr statement. This is because, unlike tape errors, disc errors are not always fatal. This variable holds the number of the last disc error which occurred so the program can take appropriate action.

You can also now use the Auto function with Edit; this allows you to edit a whole block of code without having to call up each line individually. How useful this will prove in practice is open to doubt. How many of your programs have regular line numbers? It might have been handy had a renumber command been included.

All of these additional commands might leave the 464 owner asking where he stands. All programs that use legal system calls, and don't use up the Ram taken by AMSDOS will run on the new machine. However, software written for the 664 won't necessarily work with the 464, although it seems unlikely that anyone would go out of their way to use the extra commands for a commercial program. It is not planned to offer the new Rom as an upgrade to 464 owners.

All this information is a lot to cram into a manual. Not only do you need a Basic primer, but a guide to AMSDOS, CP/M, and Logo, the language supplied free with the system disc. Amstrad has proved equal to the task. The manual kicks off with a foundation course explaining some of the basics to the novice; after that is a detailed alphabetical list of the keywords, with details on syntax and program examples. Next come some notes on handling data on cassette and disc.

Although there are many good things in the 664, the new machine is perhaps chiefly remarkable for what it doesn't offer. It doesn't offer more Ram, despite the low cost of the chips today. It doesn't offer sideways Roms — the facility is there in the hardware, but extra circuitry is required, you don't just plug them in. There is still no warm reset, except in CP/M, so if you get yourself tied up in knots with ink colours, sounds and graphics, it's just too bad. ■

CONCLUSIONS

- The machine in many ways represents yesterday's technology. The hoary old Z-80, and CP/M. The choice of the 3in. disc format is rather suspect, it now looks as if the 3.5in. format, which offers nearly twice the capacity, will dominate the budget drive market with Apple and Hewlett-Packard adopting it.
- All that said, at £339 for black and white or £449 for the colour version, there is little doubt that the system offers unrivalled value for money.
- Unlike the much vaunted 16-bit invasion, this machine is here today, debugged, and with a rising tide of commercial software support. Many companies see the machine as the natural next conversion after Spectrum and Commodore releases.
- The clean Basic, simple DOS and clear manual offer computing without tears for the beginner while giving the expert plenty to play with.

W LOOKS... NEW

ATARI 130XE

WHATEVER ELSE you might say about the new Atari 130XE, it's great value. You get a 6502-based micro with 128K of Ram, 11 graphics modes, five text modes, four sound channels, a very good full-stroke keyboard and a penny change from £170. That's £60 less than the official price of a slow, less stylish Commodore 64, and half the going rate for a fast 32K BBC Model B.

Fortuitously, Atari has ended up with the best of both worlds. The customised chips, which provided sprites, a 256-colour video display and sound in the days when firmware had to compensate for the very high price of Ram allow good graphics in only 8K of screen Ram, but you also have more memory than you know what to do with.

The 130XE has two standard joystick ports, a cartridge slot, a reset key, an on/off switch with red indicator LED, a serial bus, an expansion port and a composite video monitor output as well as a TV connector.

On the serial I/O port, SIO, you can hang a daisy-chain of existing peripherals including the 1050 disc drive, various printers, touch tablets, track-balls, light pens, the dedicated Atari stereo cassette deck — ordinary recorders not allowed — and the Minor Miracles WS-2000 modem. Compared with the cost of expanding an Electron or Spectrum Plus to a similar level, the Atari 130XE is actually cheaper.

Furthermore, matching 3.5in. — not non-standard 3in. — floppies, cheap hard discs and printers are claimed to be on the way.

The 400/600XL/800 compatibility also allows the new Atari to run a vast range of existing software and peripherals. The machine comes with a brief list of about 800 programs already available.

I tried a number of games on the 130XE, from K-Razy Shoot-Out, a 1981 classic version of Berzerk, through Zaxxon and Pole Position to Drop Zone, a sparkling new rewrite of Defender. Everything ran correctly, though an XL Translator program is needed for some early software.

The most noticeable difference from the previous Ataris is that the video display signal is much stronger. It produces an image that is sharper and has much higher contrast. This is a particular benefit with the AtariWriter word processor and VisiCalc spreadsheet. However, it is less kind to the cruder graphics of some older games, including Defender.

All round, the 130XE is smart and well made, but there are a few points I don't like. For example, the function keys are not as handy on the top as they were, on the 800XL, down the side.

Also the top right f-key is a system reset or "warm start". This is unprotected, which is going to cause some people anguish with a few programs outside Basic.

The "enhanced" cartridge slot has unprotected plastic pins which are going to get broken off. As the slot is in the back, instead of on top, you may have to lift the machine to slot a cartridge in. The real reason it has been taken round the back is to save on the expansion port. This used to be a full pin-out from the mother board. Now the expansion port is just the cartridge slot plus the missing lines to a small extra port. These points may seem trivial, but the Atari 800 and 800XL were in these respects better designed.

The only other real limitation of the new machine is the Atari Basic. Although this is friendly, offers syntax checking on line entry, and was considered very good when it first came out, it was written in 1979. Atari has fitted the latest further-debugged Revision C Rom of the original, but people now deserve a faster language with better control structures, such as Optimized Systems Software's Basic XL. OSS wrote Atari Basic, and its compatible XL upgrade should have been built into the machine instead.

Optional programming languages include Microsoft Basic, an excellent Logo, Forth (various), Pilot, Tiny C, C-65 and the most brilliant language of all, Action! This is a highly-structured, compiled language which is somewhat like C crossed with Pascal, is almost as easy to write as Basic, but runs almost as fast as assembler.

When it comes to the Atari's extra memory, you have to appreciate that you can't simply bung a extra 64K of Ram chips into a 64K machine. The 6502C can only address 64K, so when you allow for the Basic, what you have is under 38K — roughly the same as the Commodore 64 and Spectrum.

To make the extra Ram accessible, Atari has added a new custom chip called Freddy, as memory manager. The extra Ram is available in 16K pages which are accessed according to the formula

POKE 54017,193 + 4*ADDRESS − 16 *MODE

That won't scare readers of this magazine, but it will bother Uncle Ernie who thinks Print Fre(0) should give 131,072 bytes free.

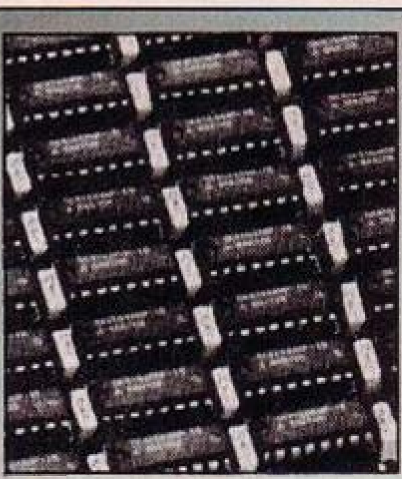
So far there is no commercial software that can use the extra Ram. Atari is planning to launch an enhanced version of its popular word processor, AtariWriter Plus, and more serious software to utilise it. Examples are a productivity range of iWord, iCalc, iBase, iPlot and iLan, a home finance program Silent Butler, and a do-everything wonder package modestly called Infinity. Networking is planned. I wouldn't expect any of these Real Soon.

However, these developments show that Atari is now heading in a different direction — towards the more serious, more experienced user, and away from its reliance on games. Of course this is also the direction of Commodore, which has built CP/M into its forthcoming C128 replacement for the antiquated C64, and Amstrad, with the repackaged 664.

Atari has also produced a new disc operating system, DOS 2.5. This has the power and ease of use of DOS 2 and none of the disadvantages of the enhanced-density DOS 3. It comes with a "silicon disc" program which allows spare Ram to be used as a virtual disc drive, greatly speeding up disc operations. ■

CONCLUSIONS

- The Atari 130XE is a well designed, well finished micro.
- Being 800XL compatible, the 130XE is well supported with existing software and peripherals.
- The Atari 130XE costs £169.99 inc VAT. On its price/performance ratio — bits per buck — and facilities this makes it, in theory, better value than any other machine on the market. In practice it will be a while before the extra Ram is exploited by any commercial software.
- In the long term, the Atari 130XE will appeal to those well heeled buffs who want to do word processing and other serious stuff.



REVIEW

What do you get if you cross a Commodore 64 with a CP/M business machine and a new 128K micro? Arthur Young finds out.

128K IS THE 1985 fashion adopted by manufacturers eager to stimulate a depressed home computer market. Within the constraints of current technology memory expansion is the obvious way to create a new product, as Atari and Enterprise have already shown. In reality just expanding Ram from 64K to 128K advances home computing only marginally.

The Commodore 128 follows in the wake of the unsuccessful C16 and Plus 4 — both victims of Commodore's incompatibility of models that alienates software houses who are not prepared to support an ever increasing variety of machines in smaller numbers. In upgrading their product range Commodore had to come up with a machine that met the fashion yet was compatible with other Commodore products, especially the CBM-64.

Commodore deserves applause from all quarters of the industry for at last establishing compatibility within their range, yet producing a really exciting new machine. The Commodore 128 is in fact three computers in one.

It is a 128K machine with a much improved Basic. It is to all intents and purposes a Commodore 64. It is also capable of running CP/M and well warrants the description of both home and small business computer.

The three computer identity is achieved by an architecture that combines the 6510, the 8502 and Z80A microprocessors, a combination that allows for three main operating modes. Five modes are available on the 128, Commodore 64K mode, Commodore 128K mode and CP/M mode and optional 80 column screen modes available in 128 and CP/M mode only.

On powering up the Commodore 128 defaults to the 128K mode with a 40 column screen. The 128K mode runs an extended version of Commodore Basic 4.0 known as Basic 7.0. An optional 40/80 column key located in the down position — like shift lock — activates 128K 80 column mode. The other modes are attained via Basic commands or by having a Commodore 64 cartridge plugged for CP/M mode, into the game port for 64K mode, or CP/M utility disc in the disc drive when the computer is turned on. The 80 column mode can also be activated from Basic using an Assign Command.

The 128K mode provides all the normal Commodore 64 facilities. However, on switching on an impressive "122365 bytes free" message is displayed on the screen. In 40 column mode a VIC 11 chip provides a composite video output, 80 column mode is produced by an RGB output from an 8563 video chip. The 128K Ram is divided into two banks; the lower bank for the text portion of Basic programs, the upper for variables strings and arrays. Sound is produced in all modes by a SID chip.

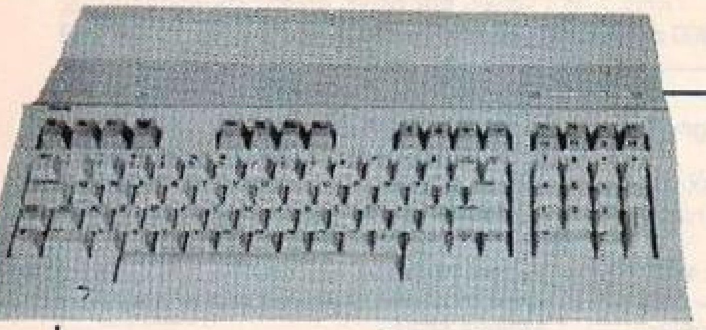
In 64K mode the 128 behaves exactly like a Commodore 64.

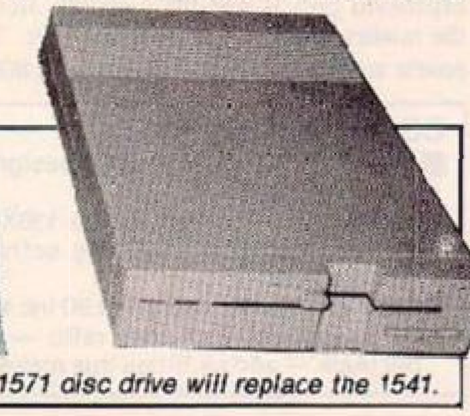
The screen displays the familiar "38911 bytes free" message and a 40 column screen only is available. Initialisation is achieved from Basic by the command "GO 64", alternatively the machine will default to the 64K mode driving power up when a Commodore cartridge is located in the expansion-game port.

CP/M mode is initialised by default in powering up if a CP/M utility disc is located in an attached drive, or from the 128K mode by using the basic command "BOOT". The C128 runs CP/M version 3 using the on board Z80A processor running at 4MHz.

Basic 7.0, which is available in the 128K mode, is the most extensive version of Basic yet to be released by Commodore. It is an enhancement of CBM Basic 4.0 with a total of more than 140 commands, functions and statements. Structured programming commands, similar to those used in Simon's Basic make Basic 7.0 also the easiest Basic yet released by Commodore, being literal without being wordy. Some commands give Basic the structured programming power of Pascal or Fortran, notable are a Do/Loop/While/ Until/Exit command and a Print Using command with an accompanying definition command Pudef. There is also an extension to the If . . . Then statement using Begin and Bend to define any number of lines to be executed as part of the then condition. Error trapping within programs is handled by a Trap and Resume combination.

In addition the Commodore 128 offers a number of commands to help enter and debug programs. There are the regular Auto and Delete and a Help key that homes in on syntax or division by zero errors highlighting them on screen in reverse video. Particularly useful are Tron and Troff, a function that traces each line of a program as it is being executed and prints the line number to the screen.





Commodore's new quick 1571 disc drive will replace the 1541.

COMMODORE 128

Built into the C128 is a handy 14 command monitor.

The graphics facility of the CBM-64 was one of its more attractive features. This is retained on the C128 in the 64K mode. In 128K mode there are commands to draw, move fill and manipulate points, lines and shapes on a high resolution screen. A single command produces split screen for text and graphics. In all 128K mode allows for normal text screen, high-resolution screen, split screen text/high resolution, multicolour high resolution or split screen with multicolour and text. Screen type is chosen using a new command Graphic, other new commands are Circle, Box, Paint and Draw. 128K mode provides the same 16 colours that are available in 64K mode. However, because of the two screen mode, higher resolution is possible and the maximum is 640 by 200.

As in 64K mode 128K mode allows for up to eight sprites, these can be readily created using a sprite generator package resident in firmware. Three sound channels are available. The sound is controlled by five basic commands Vol, Envelope, Filter, Tempo and Sound.

The dowdy shoebox image of the Commodore 64 has been replaced by a slimline beige console that any style-conscious businessman should be pleased to have on his desk. A full size typewriter style keyboard has 92 keys, that travel and locate well.

The keyboard is in six parts: a standard wordprocessor type layout with symbols, numbers and letters; a 14-key numeric pad; four double function programmable function keys, six cursor control keys; and a further two rows with 40/80 column key, line feed, cap lock and so on. Interfacing with the C128 is achieved via a range of ports located to the side and back. These are a user port, a cassette port, two games ports, serial port — Commodore standard, RF/TV port, audio input and output ports, composite video/RGBI video.

Two new peripherals are already on the way to accompany the new machine. To many people's relief a new disc drive the 1571 will replace the old 1541. The 1571 will be a 5.25in. disc with a 350K capacity.

The other peripheral is a matter of necessity rather than choice, that is unless you want to have two monitors. 80 column mode produces an RGBI output. ■

CONCLUSIONS

- By the end of 1985 the Commodore 128 will be a strong contender for micro of the year. Already in excess of 6,000 software titles are in existence.
- In CP/M mode the C128 is a realistic small business computer, in 64K mode it is a home machine, in 128K mode I have no doubt it will prove its worth.
- The one doubt that exists about its future is the price, which is in the hands of the dollar/pound dealers.

DATAB

John Dawson continues his mini series on databases with a look at how information is extracted and how to secure it.

```
*STARBASE*
(KEYTEAM SOFTWARE)
MIKE CHALK (C)1984

PRESS LETTER KEY FOR UTILITY

<A> SBU01 Recover deleted records
<B> SBU02 Increment field
<C> SBU03 Field statistics
<D> SBU04 Configure printer
<E> SBU05 Print file review
<F> SBU06 Print record cards
<G> SBU07 Build print format
<H> SBU08 Print address labels
<I> SBU09 Print form
<J> SBU10 Move records
<K> SBU11 Calculate
<L> SBU12 ASCII form print
<M> SBU13 Merge subsets

<S> STARBASE

<Q> QUIT
```

LAST MONTH I described different types of database structure and related that to the four databases for the BBC microcomputer that I am examining. This month I'll go on to see how you can extract information from the database and how secure the data is from unauthorised prying eyes. Next month I'll deal with how easy or difficult it is to build the 'form' that you need to enter information into the database and sorting, searching and the general cost/benefit of each program.

It's worth spending some time thinking about the output that you want from the database you are going to create. It isn't all that easy to predict in advance what information you will need or what form you will want it in but planning will certainly pay off.

Suppose you had a program, at one mad extreme, that was quite complicated to set up, took up hours of your time typing information in front of the VDU and then committed all that tidy, structured information safely to disc — and then did Nothing else.

Pretty good, not a bad definition of a Write Only Memory (Wom — a sort of upper class Rom). The whole purpose of creating a database is to supply you with relevant, timely and accurate information when you want it. A database, after all, is nothing more than a program to organise and manipulate information for you.

Information can be extracted from your databases either by displaying it on the VDU or by printing a list of selected items. None of the programs, for example, will output information using the speech processor as they are supplied although the utility software supplied with Stardatabase could be extended to use this form of output.

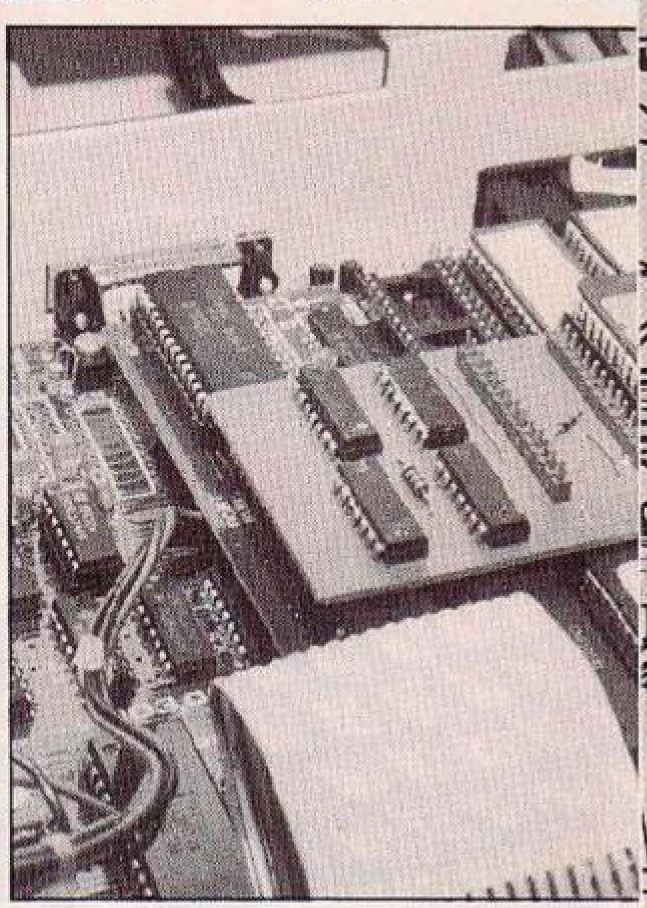
At the most dramatic level, the type of information and the number of items you need to be able to handle in relation to a single record may determine your choice of program. Figure 1 sets out the basic statistics about each of the programs. The Acornsoft database is limited in some respects when compared to the Datagem and Stardatabase programs but it costs so much less that things like the seven character field title length may not matter to you.

The maximum record length for the Acornsoft program is not stated in the instruction manual but is calculated from the number of fields and the maximum field length. The Stardatabase program is curiously limited to a maximum search/sort depth of five characters. This is an important handicap as it is very convenient to store dates in the form YYMMDD — Year, Month, Day.

Scribe will handle text

If you want to print out a batch of invoices that have been entered since a particular date, make a list of who owes a subscription to the club, or find a particular birthday, you will have to do this as a sequential search on more than one field, that is year first and then the month and date.

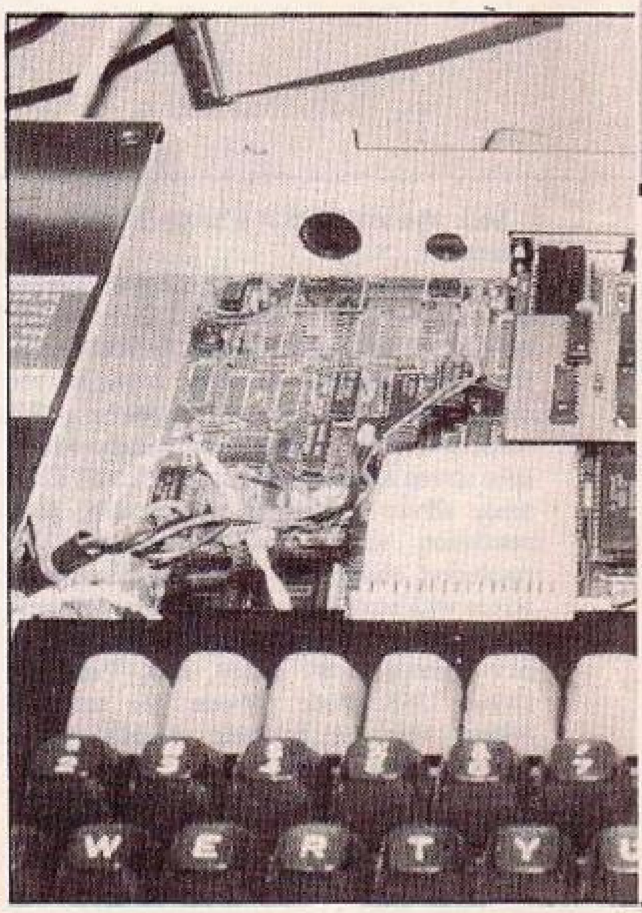
The Scribe database is the only program of the four that can claim to handle text. 918 characters — the maximum field length — is a responsible paragraph of about 150 words and this, combined with the facility to wordwrap text when it is printed makes the Merlin database very attractive for generating standard contracts, leases or letters, or for managing projects where extensive free text comments are necessary. The fuzzy search



conditions of Instring and Not Instring will work on the whole of a 918 character field.

Stardatabase will also avoid broken words at the end of lines when a record is printed using one of the disc based utility programs. Note that Stardatabase has no output facilities to a printer in the Rom chip itself.

Datagem and the Acornsoft databases suffer from their association with the View word processor. Both programs will create macro



BASES

fields for View although this is much easier in the Acornsoft program. The problem is that a View macro field may not be more than 132 characters long and View will not wrap words that run beyond the right margin.

Consequently, the output capabilities of both programs are severely limited for anything more complicated than a name and address file or short items of information to drop into a View text file where variations in length will not upset the formatting of the output too greatly.

Both Stardatabase and the Acornsoft database are accessible from Basic programs. The Acornsoft instruction manual says:

"Each datafile starts with a large block of information which relates to the format of the file. The names and lengths of the fields are contained in this block which is called the control block . . . A record is stored as a series of fields one after another. These fields have the following format — The start byte 00 — A byte containing the length of the field — 2 to 240 bytes of data in reverse order . . . This is used because it is the same as is used by Basic's Print£F,A$ and Input£F,A$. Thus it is a simple matter to produce routines which can read and write the fields."

Stardatabase, on the other hand, provides both prewritten Basic utilities and a number of "spooled" procedures which can be incorporated into your own Basic programs. The procedures make use of special function calls in the form *SBnn.

These * commands are intercepted by the Stardatabase chip and, consequently, the Rom must be in place in any machine which is to run a utility program. The following procedures are supplied:

Load record
Save record
Open up side 0 or side 1 of the disc for access
Load file
Load the bit map of which records are current
Load information about the fields in the record
Load the input card to the screen
Save the bit map
Save the current screen as an input card
Check, Set and Clear positions in the bit map
Clear the input card ready for new data
Find the specification of a field
List the field types in a record
Load a subset of records from the database
Load a specific record from the subset to the data buffer
Save a record in the subset to the disc
Get a field from the record currently in the buffer
Save a field in the record buffer
and several more.

Stardatabase does offer a comprehensive system for creating and then manipulating data according to your own requirements. The Acornsoft program is less sophisticated in the form in which you purchase it but has the same scope for handling information.

The Scribe database relies on exporting information to the Scribe word processor for report writing and a compiled Report Writer programming language which will allow mathematical operations on fields within a record, placing the result into another field in the same record and many other functions.

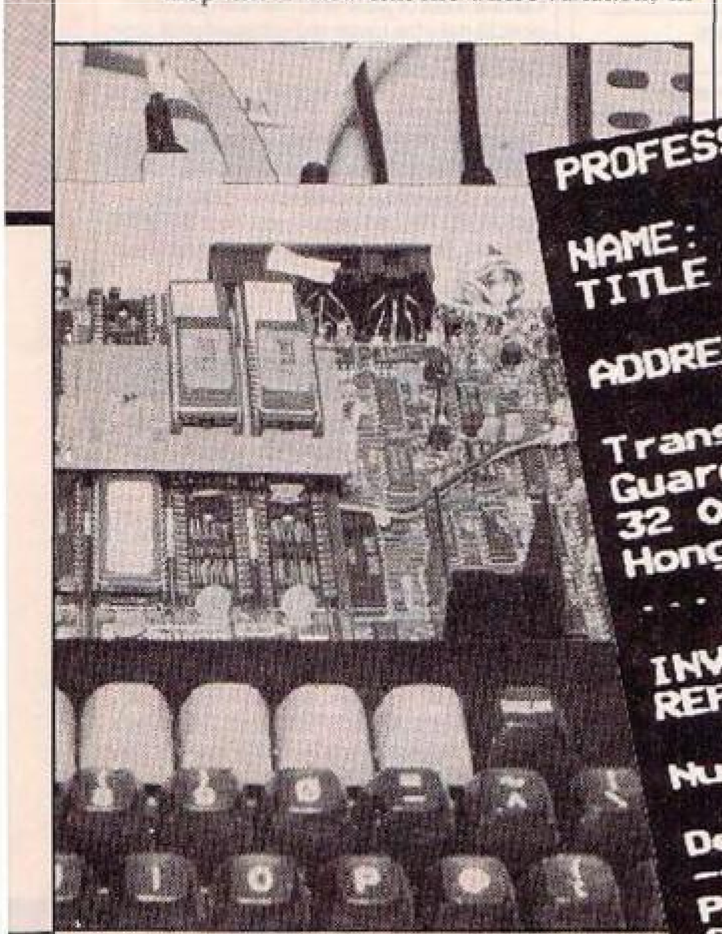
Mail merge is excellent

Unfortunately, the Report Writer module for the Scribe database was not available when this article was written — early April — and it's difficult to judge from the provisional manual just how powerful or useful it will turn out to be. However, the mail merge and report formatting facility using the Scribe word processor is excellent. You can't perform calculations on the data but it is easy to layout a standard letter or invoice.

Datagem is self contained. Having bought this program first, I now use Stardatabase and the Acornsoft program because the Datagem database is time consuming and inflexible when you are trying to print out information. I gave the Datagem system four stars in figure 1 for a commercial data handling program because many operations are predetermined and simply have to be carried out at set times.

Once a Datagem database has been configured and the outputs have been established then it's a very good program for

(continued on page 54)



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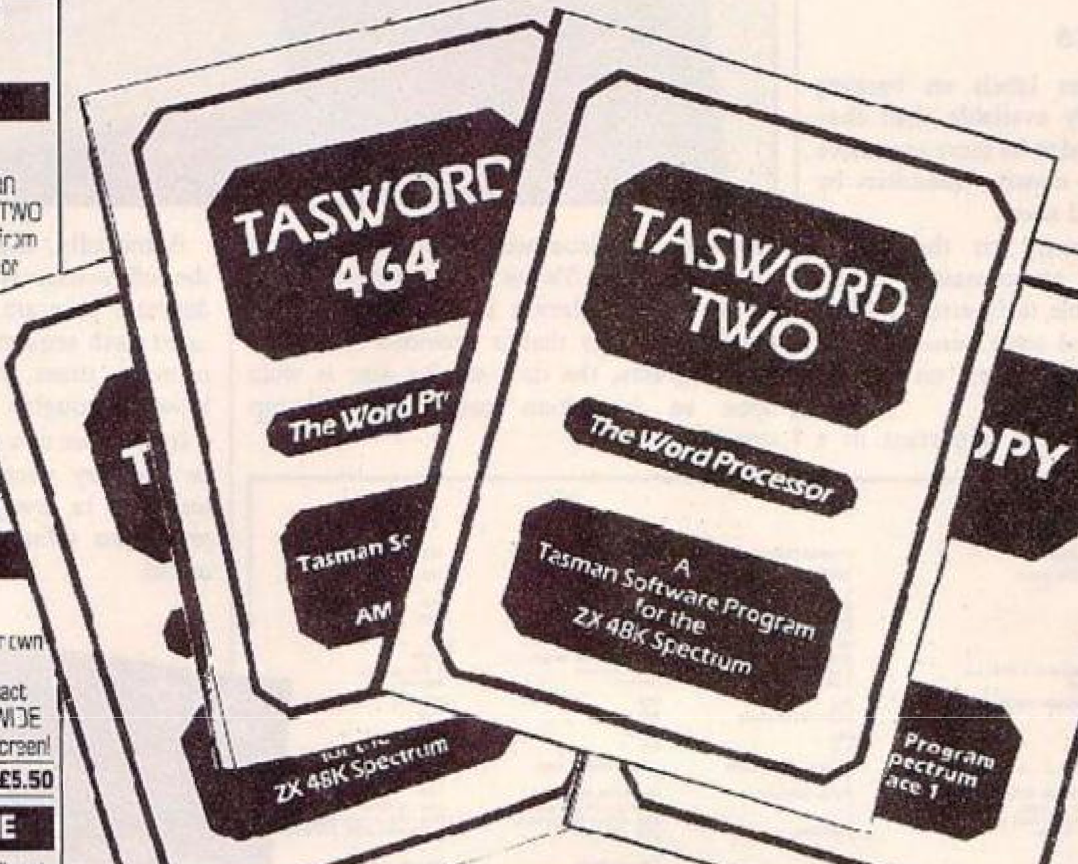

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(continued from page 51)

many purposes. But try to set up a quick and nasty output form for a new purpose and it may take you some time to unravel the input form which is not kept separate from the print format card.

Printing address labels is one of the standard functions of most database systems. Stardatabase is very good at doing this and can cope with up to eight labels across a sheet of continuous stationery. Remember that the program has to fetch the name field from up to eight records for the first line of the label, then the first line of the address from the same records, and you will appreciate why most programs don't offer this facility.

Security of data

Single width address labels on backing paper are more widely available than they used to be but these tend to be more expensive than the label used in massive quantities by companies who do mail shots.

Datagem scores heavily on the mathematical functions that are contained in the Rom chips. It is possible to interrelate fields to calculate VAT, total costs across all the records in a database, discounts on varying sizes of order and so on.

Security of data may be important in a commercial environment and if you have a list of your boy/girl friends on a database it may be personally relevant as well. Despite the password facility that is provided on two of the programs, the data on the disc is wide open to inspection using the *Dump command.

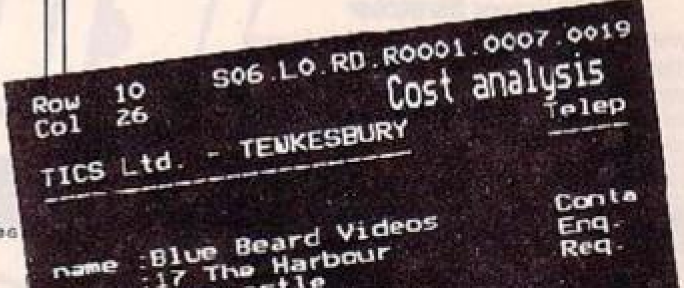
Admittedly, the Acornsoft database stores the information in reverse order and the Stardatabase program puts records in a complicated hash sequence on the disc to speed up recovery times; but it is still possible to browse through a database file.

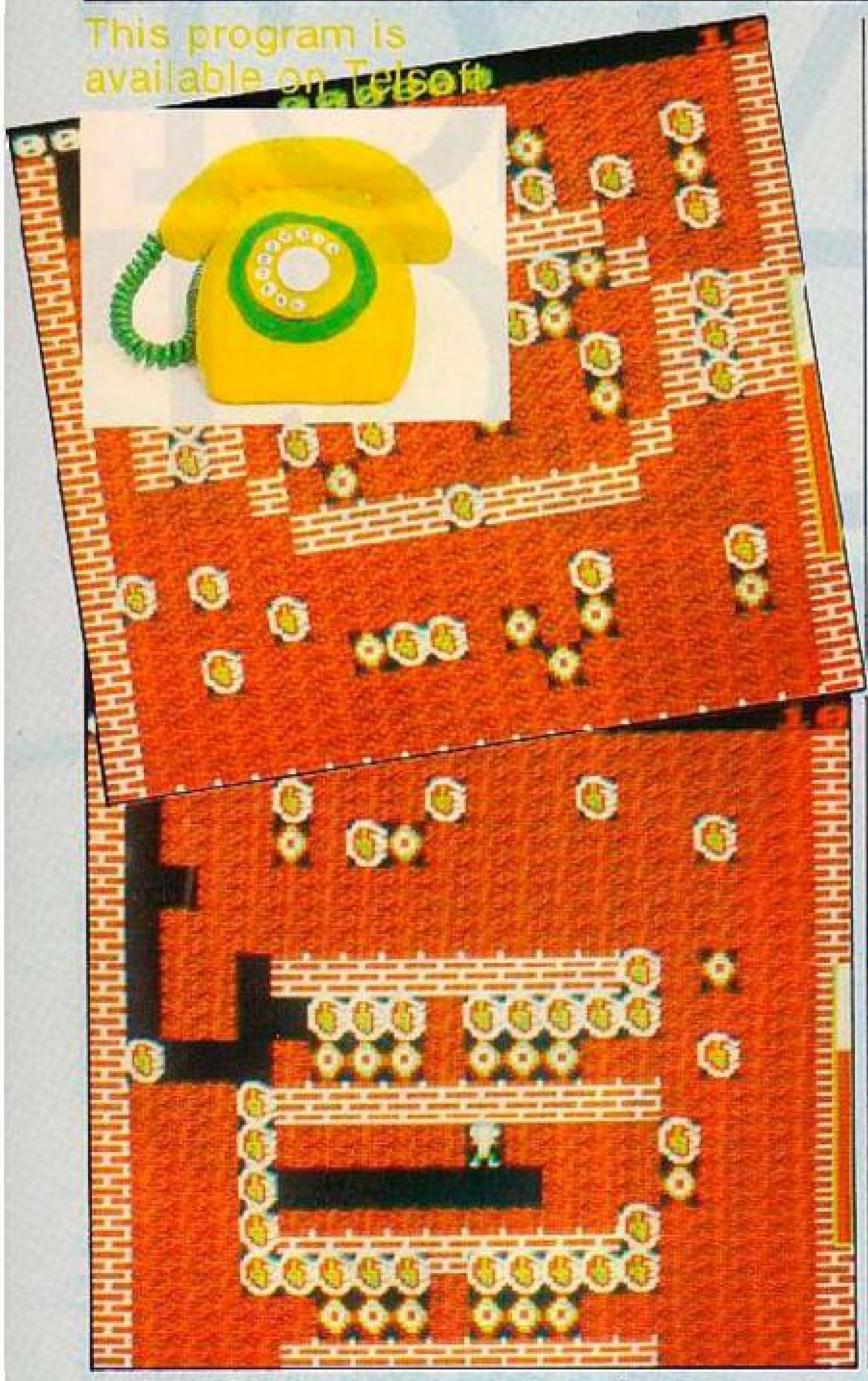
In an office or a factory where the BBC may be used by people who are comparatively unskilled in low level micro operation, the protection offered by a password may be useful. ■

Figure 1. Program comparison.

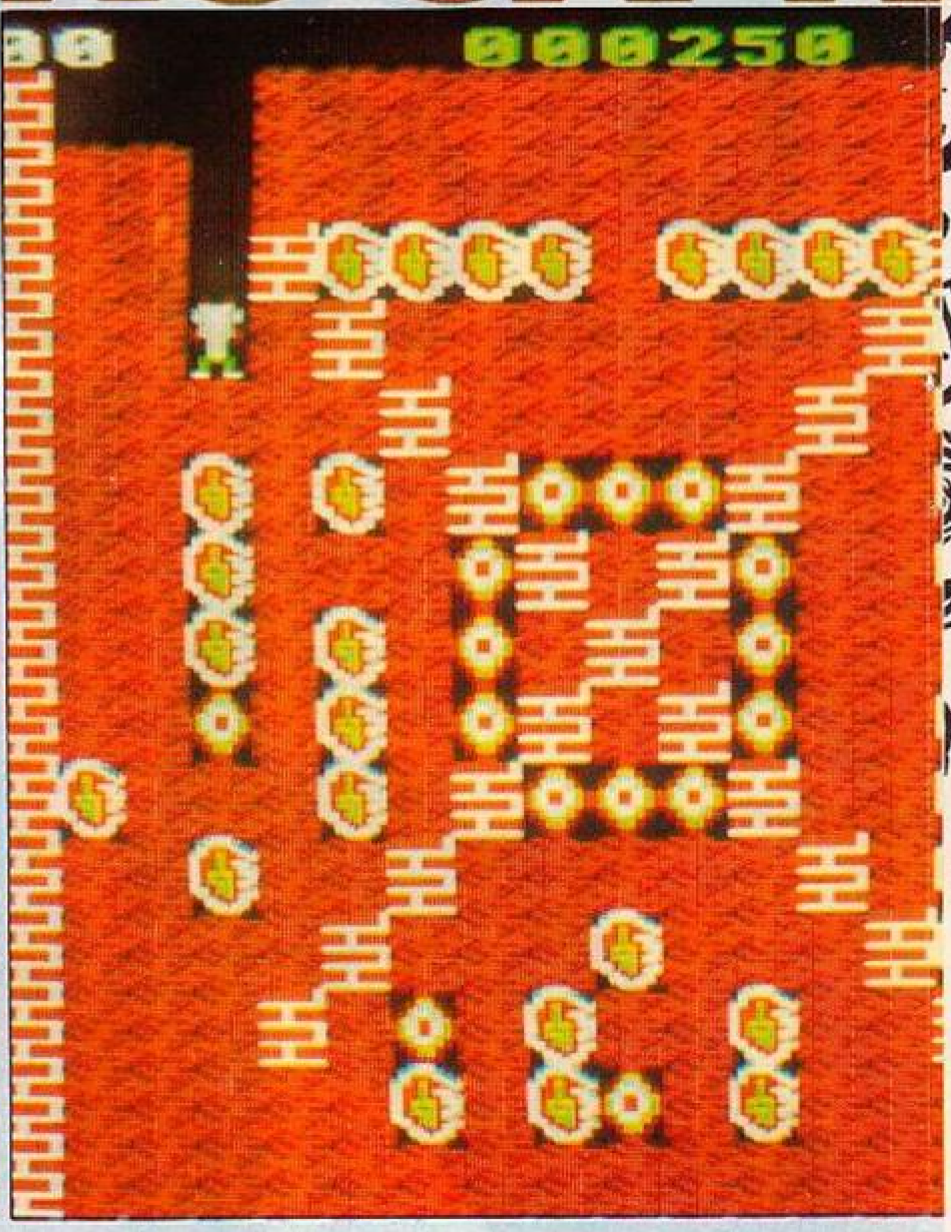
Star rating ***** maximum

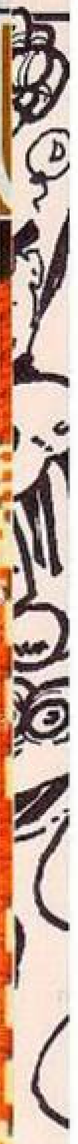
	DATAGEM	STARDATABASE	ACORNSOFT	SCRIBE DATABASE
Supplied as	24K ROM board	16K ROM + 70+ Disc	Disc	16K ROM + Disc
Use of files at once	1	1	1	1
Max. field length	120	255	240	219
Max. record length	6,43	808	7686	2048
Max. field title length	130	808	7	16
Max. number fields	62	80	32	36
Max. number records	5100	4095	Disc cap./Rec. length	4090
Max. field size	16 Mbytes or 4 surfaces	2 disc surfaces	1 disc surface	1 disc surface
Databases/disc	Several	1 only	Several	Several
Wordwrap on input	NO—single line fields	NO	NO	NO
Wordwrap on output	NO	YES—in one utility	NO	YES
Password	NO	YES	NO	YES—4 level
Read only access	NO	NO	NO	YES
Search combinations	<>,=,<>,<=,>=,AND,OR,XOR	=,<>,>=,<,AND,OR	<>=,OR,NOT,AND	>,>=,=,<,<=,<>
No. of search levels	8	1	7	8 "indexes"
Combine levels	YES—VERY GOOD	Merge subsets	Sequential searches	YES
Search 'n' fields	One or all fields	1	'As many as you want'	Max. 4 fields
Search depth	Max. 120 or field length	5	Max. 240 or field length	Max. 118 or field length
Fuzzy search	YES—GOOD	INSTRING	YES—GOOD	INSTRING, NOT INSTRING
Search ergonomics	****	***	****	*
Number of fields to sort	1	4	Max. all fields	No sort at present
Sort speed	AVERAGE	FAST	VERY SLOW	N/A
Ascending/Descending	YES	YES	Ascending only	N/A
Maths facilities	EXTENSIVE	BASIC utilities	Sum, stand. dev., mean	Report Writer
Auto. data entry	YES—Default record	NO	NO	YES—Date & last record
Data validation	YES—Numeric & Date	NO	NO	YES—Numeric & Date
Export data to WP	YES—View or Wordwise	NO—But see text	YES—View macros or text	Scribe mailmerge
Import from other programs	YES—*EXEC from BASIC	Possible using BASIC	YES standard BASIC files	NO
External print layout	YES—LIMITED	YES—GOOD	YES—LIMITED	Scribe & Reporter Writer
Print address labels	Single width only	YES—up to 8 wide	Single width only	Not known at present
BASIC access to files	NONE	YES—good procedures	YES—but no software	NONE
Modify record structure	YES—time consuming	YES—Easy	YES—Easy	YES—Not easy
Recover deleted records	YES	YES	NO	Apparently not
Trap duplicate records	NO	NO	NO	NO
Optimise disc usage	NO	NO	NO	NO
Go to record number	YES	NO	YES	NO
* commands within program	YES	NO	YES	Disc catalogue only
Manual	*** But not easy to use	**	***—Very easy to use	* But provisional only
'Find a single item'	***	**	***	*
Commercial data handling	****	**	***	***
General record keeping	***	***	***	**
Input form construction	*	**	***	**





ROCK R





INSPIRED BY one of the best games of 1984 — Boulderdash — Rockrun sets you down in an underground cavern where your task is to collect 16 diamonds before time runs out. As you tunnel through the earth you inevitably dislodge boulders and rocks: if they are piled on top of each other you may trigger an avalanche.

There are 10 screens, nine of which can be selected by pressing the appropriate letter when the title page is up, while the 10th must be worked up to. Each of the screens is so designed that the diamonds must be collected in the correct order. Otherwise the player or some diamonds will be trapped — whereupon the player may either press Q to loose a life or wait until the time runs out. The time is represented by a column on the right hand of the screen.

The game runs on both the Electron and the BBC but BBC owners will need to slow it down by increasing the value of the X and Y registers in the delay routine at line 350. You can experiment with different values to find

Listing 1.

```
   10ENVELOPE1,1,3,-20,1,10,2,3,0,0,0,0,0,0:ENVELOPE2,
3,1,0,-2,10,2,1,0,0,0,0,0,0:ENVELOPE3,2,1,-4,2,1,2,1,0
,0,0,0,0,0
   20DATA2,51,85,85,51,16,51,20,4,204,170,170,204,128,
204,130,21,16,17,16,32,32,32,102,130,120,136,120,64,64
,64,102
   30DATA0,2,51,119,85,51,20,55,0,4,204,238,170,204,13
0,206.16.17.16.17.16.32.32.102.128.136.128.136.128.64.
64,102
   40DATA1,119,255,255,119,48,19,52,0,136,68,204,136,0
,0,8,59,60,51,48,3,4,8,12,4,0,0,0,0,8,12,0
   50DATA0,1,119,255,255,119,48,19,0,0,136,68,204,136,
0,0.18,19,33,51,48,2,2,3,0,0,0,0,0,0,0,0
   60DATA1,51,85,119,51,16,17,18,0,204,238,238,204,128
,8,132,21,16,17,16,1,2,6,0,138,134,136,128,8,4,2,6
   70DATA0,1,51,85,119,51,16,17,0,0,204,238,238,204,12
8,8,16,17,1,17,16,0,0,1,8,8,128,136,128,8,8,8
   80DATA51,119,71,222,188,188,188,188,136,204,118,63,
31,118,63,183,173,188,158,222,71,35,51,17,151,183,166,
151,183,46,118,204
   90DATA1,1,18,18,53,53,107,107,8,8,132,132,202,202,1
09,109,107,107,53,53,18,18,1,1,109,109,202,202,132,132
,8,8
  100VDU23,128,188,191,218,253,123,223,181,95,23,129,1
17,86,126,215,189,126,125,92,23,130,254,254.254,0,239,
239,239,0
  110DATA&10,0,2,0,4,0,6,0,&11,0,1,0,100,0,6,0,1,0,1,0
,255,0,1,0,1,0,3,0,1,0,3,0
  120FORT=0TO5:T?&80=0:NEXT
  130VDU23,131,24,60,126,255,255,126,60,24,23,132,0,24
,60,126,126,60,24,0,23,133,0,0,24,60,60,24,0,0,23,134,
0,0,0,24,24,0,0,0
  140G%=&4000
  150RESTORE20:FORT=0TO287:READD:T?G%=D:NEXT:st1=G%:st
2=st1+32:ri1=st2+32:ri2=ri1+32:le1=ri2+32:le2=le1+32:b
o=le2+32:di=bo+32:sou=di+32:sou2=sou+8:drop=sou2+8:fin
=sou2+6
  160J%=G%+288:FORT=0TO2STEP2:P%=J%:[OPTT
  170LDA#G% MOD256:STA&70:LDA#G% DIV256:STA&71:LDA#&50
:STA&72:LDA#&59:STA&73:LDA#0:STA&60:STA&65:STA&63:LDA#
1:STA&61:STA&62:STA&54:LDA#&38:STA&78:LDA#&68:STA&79:L
DA#0:STA&7A:STA&7B
  180JSRBOUL:JSRDIAM:SEC:LDA&81:SBC#5:STA&81:JSRscore:
DEC&65:JSRNUM
  190LDA#&FF:STAdrop+4:LDA#200:STAfin+4:JSRsettim
  200.start JSRdis
  210JSRDiam
  220LDX#&EF:JSRkey:CPY#&FF:BNEjug:JMPdead:.jug LDX&7B
:INX:STX&7B:CPX#3:BNEJUG:LDA#0:STA&7B:JSRdtim
  230LDA&79:CMP#&78:BNEJUG:LDA&78:CMP#&78:BNEJUG:JMPde
ad:.JUG
  240JSRdelay:JSRdelay:JSRani
```

UN

Brian Lewis avoids an avalanche.

the speed that suits you but you could start by trying LDX # 150 and LDY # 150.

To enter the program simply type in and save listings 1 and 2 one after the other. It is a good idea to save each program as soon as you have typed it all in. You can then check it by running it and save it again once you have ironed out any errors. As the program runs at &1900 as well as &E00 disc owners can save it straight to disc without resetting Page. They will, however, need to change line 790 to read

CHAIN "Prog name"

You will find the game a real challenge to play. Do not get too frustrated if you can not clear too many sheets at first: there is a definite route to follow on each screen, and very little time to find out what it is. To help you I have given you no less than 10 lives.

The numbers displayed across the top line in each screen have the following meaning: the first two are the number of diamonds collected, the next six are your score, and the last two are the number of lives left.

```
  250LDA&65:CMP#16:BNEdd4:JMPfinish:.dd4
  260LDA&63:BEQa:LDX#&B7:JSRkey:CPY#&FF:BNEa:JSRup:LDY
#3:LDA(&72),Y:AND#128:BEQf:INC&63:CLC:LDA&72:ADC#&80:S
TA&72:LDA&73:ADC#2:STA&73:.f DEC&63:JMPd:.a
  270LDA&63:CMP#14:BEQb:LDX#&97:JSRkey:CPY#&FF:BNEb:JS
Rdown:LDY#3:LDA(&72),Y:AND#128:BEQg:DEC&63:SEC:LDA&72:
SBC#&80:STA&72:LDA&73:SBC#2:STA&73:.g INC&63:JMPd:.b

  280LDA&62:CMP#19:BEQc:LDX#&BD:JSRkey:CPY#&FF:BNEc:JS
Rright:LDY#3:LDA(&72),Y:AND#128:BEQh:DEC&62:SEC:LDA&72
:SBC#16:STA&72:LDA&73:SBC#0:STA&73:.h INC&62:JMPd:.c
  290LDA&62:BEQd:LDX#&9E:JSRkey:CPY#&FF:BNEd:JSRleft:L
DY#3:LDA(&72),Y:AND#128:BEQi:INC&62:CLC:LDA&72:ADC#16:
STA&72:LDA&73:ADC#0:STA&73:.i DEC&62:JMPd:.d
  300LDA&64:EOR#1:STA&64:BEQe:JSRBOSEE:JSRDISEE:.e
  310JSRCHECK:CPX#&FF:BNEj:JMPdead:.j
  320JSRDisee:LDY#0:LDA(&72),Y:CMP#6:BNEl:JSRscore:.l
  330JMPstart
  340.dis LDY#0:.A LDA(&70),Y:STA(&72),Y:INY:CPY#16:BN
EA:CLC:LDA&72:ADC#&30:STA&4D:LDA&73:ADC#1:STA&4E:.B LD
A(&70),Y:STA(&4D),Y:INY:CPY#32:BNEB:RTS
  350.delay LDX#100:.C LDY#100:.D DEY:BNED:DEX:BNEC:RT
S
  360.ani LDA&61:EOR#1:STA&61:BEQadd
  370SEC:LDA&70:SBC#32:STA&70:LDA&71:SBC#0:STA&71:RTS
  380.add CLC:LDA&70:ADC#32:STA&70:LDA&71:ADC#0:STA&71
:RTS
  390.key LDA#&81:LDY#&FF:JMP&FFF4:.rub CLC:LDA&72:ADC
#&40:STA&4D:LDA&73:ADC#1:STA&4E:LDY#0:TYA:.E STA(&72),
Y:STA(&4D),Y:INY:CPY#16:BNEE:RTS
  400.right JSRrub:LDA&60:CMP#1:BEQF:LDA#1:STA&60:STA&
61:LDA#ri1 MOD256:STA&70:LDA#ri1 DIV256:STA&71:.F CLC:
LDA&72:ADC#16:STA&72:LDA&73:ADC#0:STA&73:RTS
  410.left JSRrub:LDA&60:CMP#2:BEQG:LDA#2:STA&60:LDA#1
:STA&61:LDA#le1 MOD256:STA&70:LDA#le1 DIV256:STA&71:.G
 SEC:LDA&72:SBC#16:STA&72:LDA&73:SBC#0:STA&73:RTS
  420.up JSRrub:LDA&60:CMP#3:BEQH:LDA#3:STA&60:LDA#1:S
TA&61:LDA#st1 MOD256:STA&70:LDA#st1 DIV256:STA&71:.H S
EC:LDA&72:SBC#&80:STA&72:LDA&73:SBC#2:STA&73:RTS
  430.down JSRrub:LDA&60:CMP#4:BEQI:LDA#4:STA&60:LDA#1
:STA&61:LDA#st1 MOD256:STA&70:LDA#st1 DIV256:STA&71:.I
 CLC:LDA&72:ADC#&80:STA&72:LDA&73:ADC#2:STA&73:RTS
  440.BOUL LDA#bo MOD256:STA&80:LDA#bo DIV256:STA&81:L
DA#&50:STA&82:STA&84:LDX#&C:STX&83:INX:STX&85:LDA#32:S
TA&86
  450.custom LDX#0:.J TXA:TAY:LDA(&82),Y:STA&4D:LDA(&8
4),Y:STA&4E:LDY#0:.K LDA(&80),Y:STA(&4D),Y:INY:CPY#16:
BNEK:CLC:LDA&4D:ADC#&30:STA&4D:LDA&4E:ADC#1:STA&4E:.L
LDA(&80),Y:STA(&4D),Y:INY:CPY#32:BNEL
  460INX:CPX&86:BNEJ:RTS
  470.DIAM LDA#di MOD256:STA&80:LDA#di DIV256:STA&81:L
DA#&70:STA&82:STA&84:LDX#&C:STX&83:INX:STX&85:LDA#16:S
TA&86:JMPcustom
```

(listing 1 continued on next page)

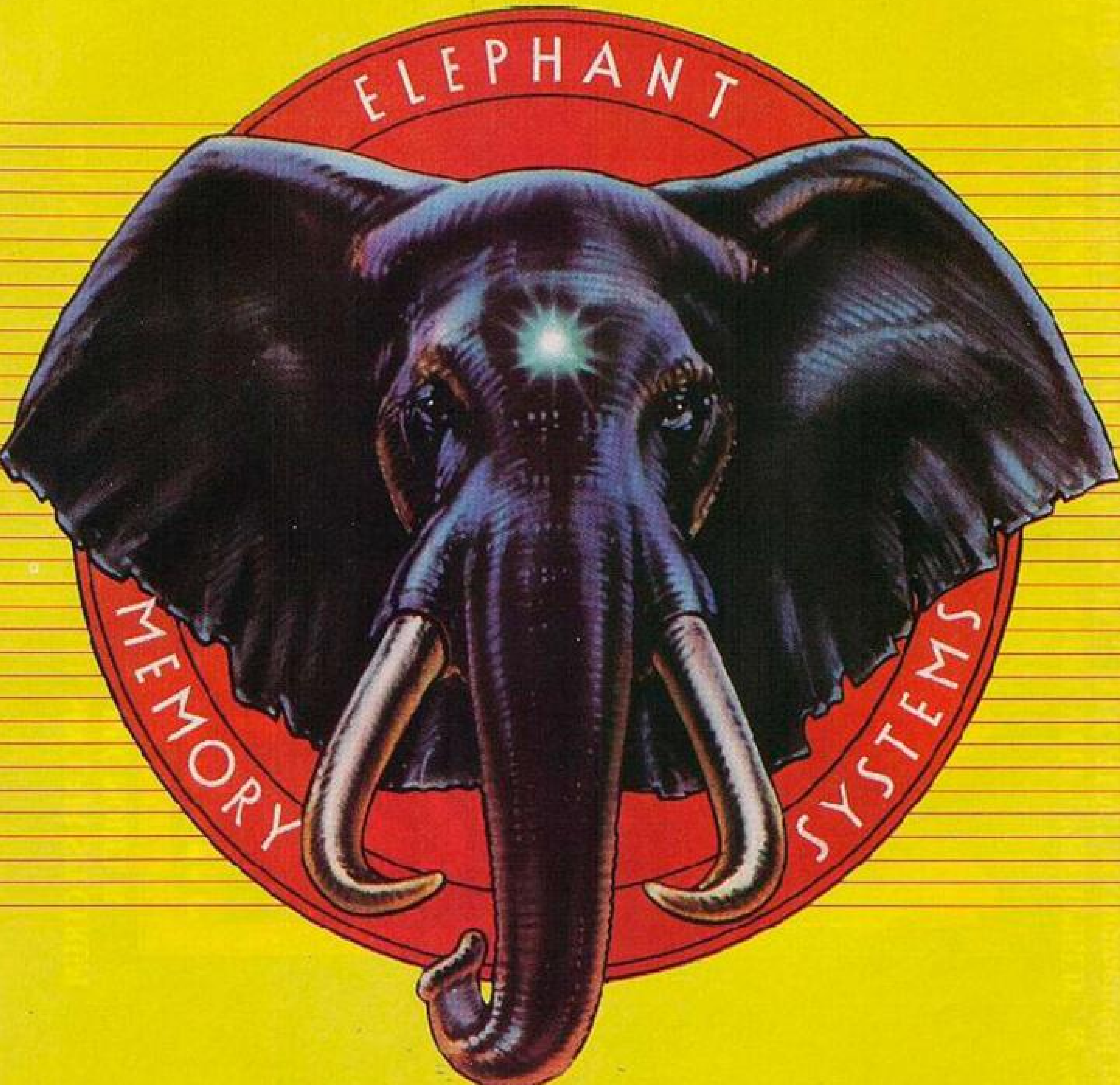
(listing 1 continued from previous page)

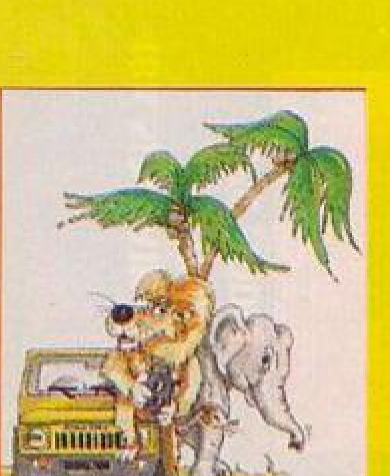
```
  480.BOSEE:LDA#bo MOD256:STA&80:LDA#bo DIV256:STA&81:
LDA#&50:STA&82:STA&84:LDX#&C:STX&83:INX:STX&85
  490LDX#0:.M TXA:PHA:LDA&C50,X:STA&4D:STA&5E:LDA&D50,
X:STA&4E:STA&5F:JSRsee:PLA:TAX:INX:CPX#32:BNEM:RTS
  500.see CLC:LDA&4D:ADC#&80:STA&4D:LDA&4E:ADC#2:STA&4
E:JSRch:CPY#&FF:BNEP:JMPrint:.P LDA&5E:STA&4D:LDA&5F:S
TA&4E
  510SEC:LDA&5E:SBC#16:STA&6A:LDA&5F:SBC#0:STA&6B:LDY#
8:LDA(&6A),Y:STA&7F:AND#8:BNEqq:CLC:LDA&4D:ADC#&70:STA
&4D:LDA&4E:ADC#2:STA&4E:JSRch:CPY#&FF:BNEQ:JMPrint:.Q
LDA&5E:STA&4D:LDA&5F:STA&4E:.qq
  520LDY#24:LDA(&5E),Y:AND#8:BNErr::CLC:LDA&4D:ADC#&90
:STA&4D:LDA&4E:ADC#2:STA&4E:JSRch:CPY#&FF:BNER:JMPrint
:.R LDA&5E:STA&4D:LDA&5F:STA&4E:.rr RTS
  530.ch LDY#8:LDA(&4D),Y:AND#8:BNEW:LDY#&FF:.W RTS
  540.rint JSRRUb:TXA:TAY:LDA&4D:STA(&82),Y:LDA&4E:STA
(&84),Y:LDY#0:.X LDA(&80),Y:STA(&4D),Y:INY:CPY#16:BNEX
:CLC:LDA&4D:ADC#&30:STA&4D:LDA&4E:ADC#1:STA&4E:.Y LDA(
&80),Y:STA(&4D),Y:INY:CPY#32:BNEY:JMPSOU
  550.RUb CLC:LDA&5E:ADC#&40:STA&8A:LDA&5F:ADC#1:STA&8
B:LDY#0:TYA:.Z STA(&5E),Y:STA(&8A),Y:INY:CPY#16:BNEZ:R
TS
  560.CHECK LDY#0:LDA(&72),Y:CMP#51:BEQA1:LDX#0:RTS:.A
1 LDX#&FF:RTS
  570.dead CLC:LDA&63:ADC&63:STA&63:CLC:ADC#1:STA&63:D
EC&62:LDA#1:STA&64:LDA#134:STA&65:.dd1 LDA#31:JSR&FFEE
:LDA&62:JSR&FFEE:LDX&63:DEX:TXA:JSR&FFEE:LDA&65:JSR&FF
FF:JSR&FFEE:JSR&FFEE
  580LDA#31:JSR&FFEE:LDA&62:JSR&FFEE:LDA&63:JSR&FFEE:L
DA&65:JSR&FFEE:JSR&FFEE:JSR&FFEE
  590LDA#31:JSR&FFEE:LDA&62:JSR&FFEE:LDX&63:INX:TXA:JS
R&FFEE:LDA&65:JSR&FFEE:JSR&FFEE:JSR&FFEE:JSRPORD
  600LDA&64:CMP#1:BNEdd2:DEC&65:LDA&65:CMP#131:BNEdd3:
LDA#0:STA&64:.dd3 JMPdd1:.dd2 INC&65:LDA&65:CMP#135:BN
Edd3:LDA#&FF:STA&7F:RTS
  610.SOU LDA#7:LDX#sou MOD256:LDY#sou DIV256:JMP&FFF1
  620.DISEE LDA#di MOD256:STA&80:LDA#di DIV256:STA&81:
LDA#&70:STA&82:STA&84:LDX#&C:STX&83:INX:STX&85
  630LDX#0:.Mm TXA:PHA:LDA&C70,X:STA&4D:STA&5E:LDA&D70
,X:STA&4E:STA&5F:JSRsee:PLA:TAX:INX:CPX#16:BNEMm:RTS
  640.Disee LDY#2:LDA(&72),Y:CMP#18:BNEC1:JMPfird:.C1
RTS
  650.fird LDX#0:.D1 LDA&C70,X:CMP&72:BNEE1:LDA&D70,X:
CMP&73:BEQF1:.E1 INX:CPX#16:BNED1:RTS:.F1 LDA#&40:STA&
C70,X:LDA#&7C:STA&D70,X:LDA#7:LDX#sou2 MOD256:LDY#sou2
 DIV256:JSR&FFF1:JSRscore:JSRscore
  660.NUM INC&65:LDA&65:LDX#0:.G1 CMP#10:BMIH1:SEC:SBC
#10:INX:JMPG1:.H1 STX&6E:STA&6F:LDA#17:JSR&FFEE:LDA#3:
JSR&FFEE:LDA#31:JSR&FFEE:LDA#0:JSR&FFEE:JSR&FFEE:CLC:L
DA&6E:ADC#48:JSR&FFEE:LDA&6F:CLC:ADC#48:JMP&FFEE
  670.score CLC:LDA&B1:ADC#5:STA&B1:CMP#10:BNEJ1:LDA#0
:STA&B1:INC&B2:LDA&B2:CMP#10:BNEJ1:LDA#0:STA&B2:INC&B3
:LDA&B3:CMP#10:BNEJ1:LDA#0:STA&B3:INC&B4
  680.J1 LDA#17:JSR&FFEE:LDA#2:JSR&FFEE:LDA#31:JSR&FFE
E:LDA#7:JSR&FFEE:LDA#0:JSR&FFEE:LDY#5:.K1 LDA&B0,Y:CLC
:ADC#48:JSR&FFEE:DEY:CPY#&FF:BNEK1:RTS
  690.DROP SEC:LDAdrop+4:SBC#10:STAdrop+4:LDA#7:LDX#dr
op MOD256:LDY#drop DIV256:JMP&FFF1
  700.PORD JSRDROP:JMPDROP:.settim
  710LDA#&38:STA&4D:LDA#&68:STA&4E:LDA#15:LDX#0:.L1 LD
Y#0:.M1 LDA#14:STA(&4D),Y:INY:CPY#8:BNEM1:CLC:LDA&4D:A
DC#&40:STA&4D:LDA&4E:ADC#1:STA&4E:INX:CPX#13:BNEL1:JMP
draw
  720.dtim LDY&7A:LDA(&78),Y:ORA#238:STA(&78),Y:INC&7A
:LDA&7A:CMP#8:BNEN1:LDA#0:STA&7A:CLC:LDA&78:ADC#&40:ST
A&78:LDA&79:ADC#1:STA&79:.N1 RTS
  730.finish LDA&79:CMP#&78:BNEO1:LDA&78:CMP#&78:BEQP1
:.O1 JSRdtim:JSRscore:JSRSOU3:JSRdelay:JMPfinish:.P1 L
DA#0:STA&7F:RTS
  740.SOU3 SEC:LDAfin+4:SBC#5:STAfin+4:LDA#7:LDX#fin M
OD256:LDY#fin DIV256:JMP&FFF1
  750.draw LDA#18:JSR&FFEE:LDA#0:JSR&FFEE:LDA#2:JSR&FF
EE:LDA#25:JSR&FFEE:LDA#4:JSR&FFEE:LDA#&D8:JSR&FFEE:LDA
#4:JSR&FFEE:LDA#&DC:JSR&FFEE:LDA#0:JSR&FFEE
  760LDA#25:JSR&FFEE:LDA#5:JSR&FFEE:LDA#&FF:JSR&FFEE:L
DA#4:JSR&FFEE:LDA#&DC:JSR&FFEE:LDA#0:JSR&FFEE:LDA#25:J
SR&FFEE:LDA#5:JSR&FFEE:LDA#&FF:JSR&FFEE:LDA#4:JSR&FFEE
:LDA#&80:JSR&FFEE:LDA#2:JSR&FFEE
  770LDA#25:JSR&FFEE:LDA#5:JSR&FFEE:LDA#&D8:JSR&FFEE:L
DA#4:JSR&FFEE:LDA#&80:JSR&FFEE:LDA#2:JSR&FFEE:LDA#25:J
SR&FFEE:LDA#5:JSR&FFEE:LDA#&D8:JSR&FFEE:LDA#4:JSR&FFEE
:LDA#&DC:JSR&FFEE:LDA#0:JMP&FFEE
  780]:NEXT
  790CHAIN""
```

Listing 2.

[illegible]

WIN A SAFARI TO KENYA





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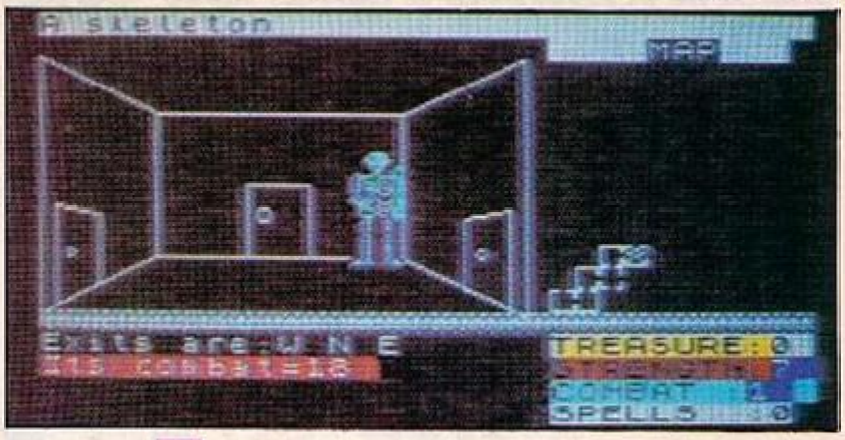
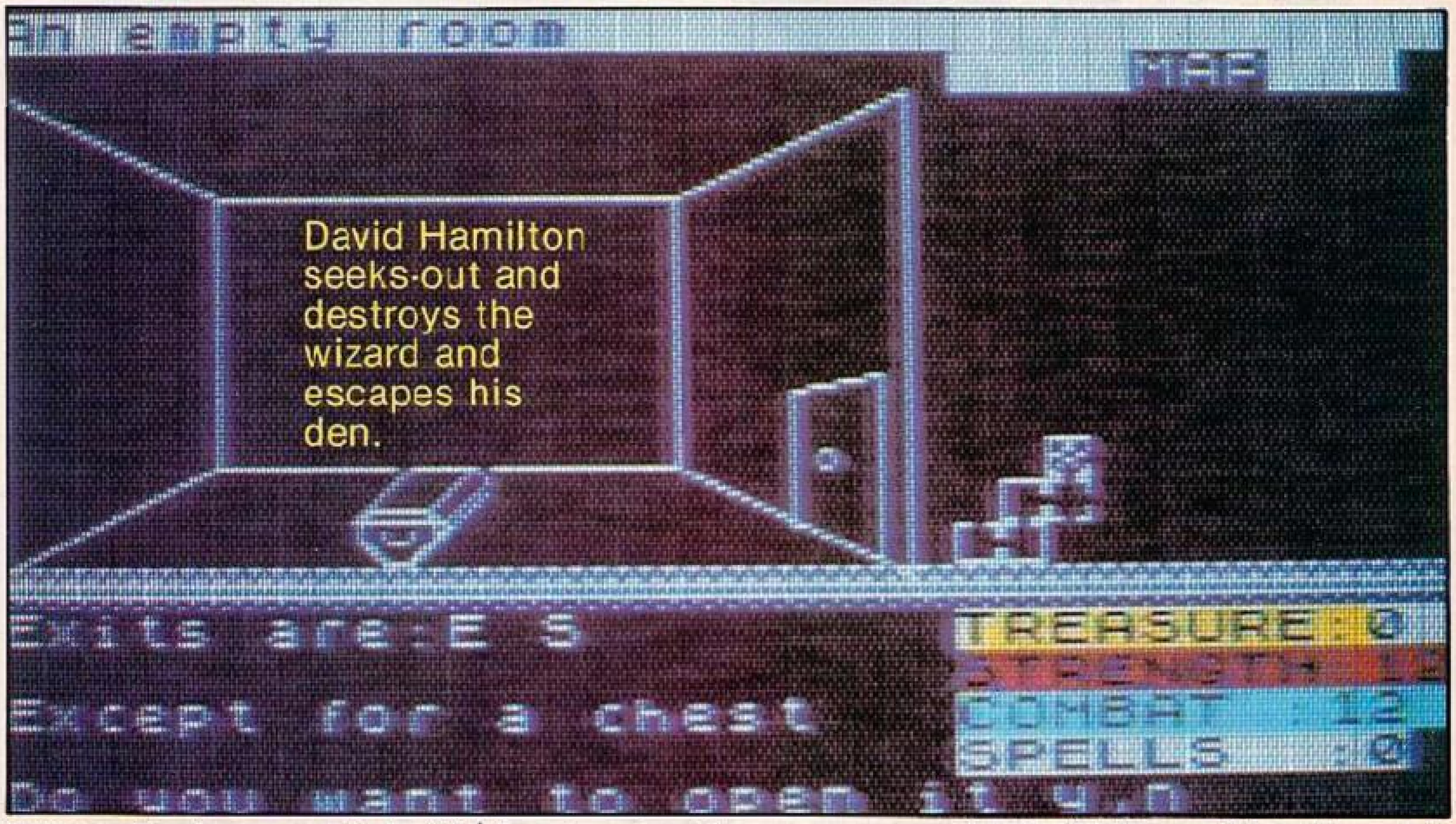


WIZARD'S DEN



David Hamilton seeks out and destroys the wizard and escapes his den.

IN THIS graphics adventure game for the 48K Spectrum your aim is to locate the wizard in the maze. Once you have found him you must do combat; if you are victorious you can then take his key and seek an exit.

But, before reaching this exciting climax, you will need to spend some time traipsing from room to room and learning the lie of the land. Along the way you can pick up food and weapons, and there may be monsters to fight. The display shows the contents of each room and its exits, while a map at the right traces the route you have taken.

The controls are:

N — go north; S — go south; W — go west; E — go east; R — rest; F — fight; R — rest; F — fight; M — use a magic spell. L — look or search a room.

Extensive use is made of user-defined graphics. These must be entered separately with the hex loader — listing 3. But first type in and save listing 1 with

SAVE "WIZARD" LINE 5

Note that characters between quotation marks should be entered in graphics mode in the following lines: 17, 18, 91, 1060, 1100, 2025, 2080, 2140 — r's only — 2150, 5000 to 5070, 9911 to 9955, 9960.

Now type in the hex loader and enter the graphics data given in listing 2. Save it after listing 1 on tape with

SAVE "WIZ" CODE 64568,799

Tape copies of the game are available for £3 — postage and packing inclusive — from D. Hamilton, 5 Murray Road, Newtonhill, Kincardineshire AB3 2PU.

Listing 1.

```
   1 REM   © 1984
+-+++++++++++++++-+++++++++++++++++++++
+-+++THE WIZARD'S CASTLE++++++++
+-++++++++++++++-+++++++++++++++++++++

*************************************
*written by:David Hamilton******
*************************************
   2 PAPER 1: BORDER 1: INK (RND
*5)+2: CLS : PRINT "Would you li
ke instructions?     (y)es \ (n)o
": IF INKEY$="y" THEN 30 TO 700
   3 IF INKEY$="n" THEN GO TO 10
   4 GO TO 2
   5 CLEAR 64567: LOAD ""CODE :
GO TO 2
  10 RESTORE 9000
  12 PAPER 0: BORDER 0: INK 7: C
LS
  13 LET moncs=0: LET rm=1: LET k
ey=0
  14 LET i$="": LET o=0: LET o$=
"": LET sp=0
  15 LET v=1: LET I$=" ": LET st
=12: LET com=12: LET t=0: LET a=
10: LET b=0: LET d=0: LET d1=0:
LET d2=0: LET d3=0: LET d4=0: DI
M m$(10,10)
  16 PRINT AT 1,21;"[redacted]MAP[redacted]":
 GO SUB 9900: GO SUB 7000
  17 LET xx=USR 64763: PRINT OVE
R 1;AT a+2,b+21;"T"
  18 PRINT INVERSE 1;AT 13,0;"UU
UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU"
  19 PRINT AT 0,0;"[redacted]": GO SUB 20:
 GO TO 29
  20 INVERSE 1: PRINT INK 6;AT 1
4,21;"TREASURE:";t: IF t<=9 THEN
 PRINT AT 14,30;t;" "
  21 PRINT INK 2;AT 15,21;"STREN
GTH:";st: IF st<=9 THEN PRINT AT
 15,30;st;" "
  22 PRINT INK 5;AT 16,21;"COMBA
T  :";com;" "
  23 PRINT INK 7;AT 17,21;"SPELL
S  :";sp
  24 INVERSE 0
  25 RETURN
  29 GO SUB 8000
  30 GO SUB 8100
```

(listing 1 continued on page 63)

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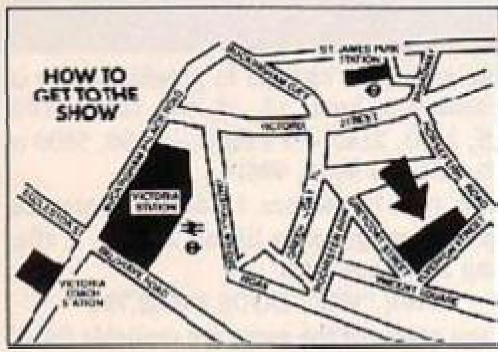

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(listing 1 continued from page 61)

```
35 PRINT AT 14,0;"Exits are ";
40 IF d1=1 THEN GO SUB 8170: PRINT "W ";
50 IF d2=1 THEN GO SUB 8150: PRINT "N ";
60 IF d3=1 THEN GO SUB 8200: PRINT "E ";
65 IF d4=1 THEN PRINT "S "
70 PRINT INVERSE 1;AT 0,0;a$
75 LET rm=1
80 IF mon<>0 THEN INK (RND*5)+2: GO SUB 5000: INK 7: GO TO 100
81 LET chest=INT (RND*4)
90 IF chest<>3 THEN GO TO 100
91 LET xx=USR 64958: PRINT AT 12,8;"MNR";AT 11,8;"CPO";AT 10,9;"TU"
92 GO SUB 93: GO TO 95
93 PRINT OVER 1;AT 16,0;"Except for a chest": RETURN
95 LET chest=INT (RND*5)
96 PRINT AT 18,0;"Do you want to open it y,n"
97 IF INKEY$="y" THEN BEEP .2,4: GO SUB 510
98 IF INKEY$="n" THEN BEEP .2,4: PRINT AT 17,0;"                ";AT 18,0;"                ": GO TO 100
99 GO TO 97
100 IF d2=1 THEN IF INKEY$="n" THEN GO SUB 9960: LET a=a-1: BEEP .01,60: GO TO 7900
105 IF INKEY$="c" THEN GO TO 1000
110 IF d1=1 THEN IF INKEY$="w" THEN GO SUB 600
120 IF d3=1 THEN IF INKEY$="e" THEN GO SUB 610
130 IF d4=1 THEN IF INKEY$="s" THEN GO SUB 620
140 IF d=0 THEN IF INKEY$="l" THEN GO SUB 8010: PRINT AT 19,0;i$: BEEP .1,0: LET d=1
145 LET rest=INT (RND*5+2)
150 IF rm=1 THEN IF INKEY$="r" THEN LET rm=0: PRINT AT 21,0;"you are resting": FOR x=1 TO 200: NEXT x: PRINT AT 21,0;rest;" hours pass": LET st=st+rest: GO SUB 20: IF INT (RND*6)=1 THEN IF t>14 THEN PRINT AT 20,0;"While asleep you were robbed": LET t=0: LET rm=0: GO SUB 20
400 IF mon=0 THEN GO TO 500
410 PRINT PAPER 2;AT 15,0;"Its combat=";monc
420 IF INKEY$="f" THEN FOR x=1 TO 5: BEEP .01,0: NEXT x: LET com=com-INT (RND*2): LET st=st-INT (RND*2): LET monc=monc-INT (RND*3)
425 IF sp>=1 THEN IF INKEY$="m" THEN LET monc=monc-20: FOR x=-20 TO 20: BEEP .01,x: NEXT x: LET sp=sp-1
430 IF monc<=0 THEN PRINT AT 15,0;"You killed it   ";AT 16,0;"          ": LET mon=0: GO TO 470
435 IF com<=0 THEN LET com=0
436 IF st<=0 THEN LET st=0
440 IF com<=0 AND st<=0 THEN PRINT AT 16,0;"You are dead": BEEP 1,4: GO TO 1000
450 PRINT PAPER 1;AT 15,29;com;" "
452 IF st>9 THEN PRINT PAPER 1;AT 15,30;st
453 IF st<10 THEN PRINT PAPER 1;AT 15,30;st;" "
460 GO TO 410
500 GO TO 100
510 IF chest=1 THEN GO SUB 93: PRINT AT 18,0;"It is a trap,a knife springs out and sticks in your leg,You pull it out"
511 IF chest=1 THEN LET st=1: LET com=1: GO SUB 20: FOR x=-40 TO 40: BEEP .1,x: NEXT x: FOR x=15 TO 21: PRINT AT x,0;"          ": NEXT x: FOR x=13 TO 21: PRINT AT x,21;"          ": NEXT x: GO TO 500
515 PRINT AT 18,0;"                    "
520 PRINT AT 18,0;"It contains ";
530 IF chest=2 THEN PRINT "gold": GO SUB 93: LET t=t+10: GO SUB 20: GO TO 500
540 IF chest=3 THEN PRINT "an axe": GO SUB 93: LET com=com+8: GO SUB 20: GO TO 500
550 IF chest=4 THEN PRINT "a sword": GO SUB 93: LET com=com+7: GO SUB 20: GO TO 500
560 IF chest=5 THEN PRINT "food": GO SUB 93: LET st=st+7: GO SUB 20: GO TO 500
570 IF chest=0 THEN PRINT "wine": GO SUB 93: LET st=st+6: GO SUB 20: GO TO 500
590 IF st<=2 THEN PRINT AT 21,0;"You are too weak to move": RETURN
595 GO SUB 9960: LET a=a-1: BEEP .01,60: GO TO 7900
600 IF st<=2 THEN PRINT AT 21,0;"You are to weak to move": RETURN
601 IF a=1 AND b=0 THEN IF key=1 THEN GO SUB 2000
602 IF a=0 AND b=0 THEN IF key=0 THEN PRINT AT 20,0;"You can't go west";AT 21,0;"The door is locked": RETURN
605 GO SUB 9960: LET b=b-1: BEEP .01,60: GO TO 7900
610 IF st<=2 THEN PRINT AT 21,0;"You are too weak to move": RETURN
615 GO SUB 9960: LET b=b+1: BEEP .01,60: GO TO 7900
620 IF st<=2 THEN PRINT AT 21,0;"You are to weak too move": RETURN
625 GO SUB 9960: LET a=a+1: BEEP .01,60: GO TO 7900
700 INK 7: CLS
710 PRINT AT 0,0;"WELCOME TO  THE WIZARD'S CASTLE"
720 FOR x=5 TO 26: BEEP .01,x: PRINT AT 3,x;"-": NEXT x
725 PRINT : PRINT
730 PRINT "The object of the game is to    find the mighty wizard.Once you have killed him you must take    his key and find the exit."
740 FOR x=5 TO 26: BEEP .01,x: PRINT AT 12,x;"-": NEXT x
750 PRINT AT 21,0;"Press any key to continue"
751 IF INKEY$="" THEN GO TO 751
755 BORDER 2: PAPER 2: INK 0: CLS
760 PRINT AT 0,0;"On the way through the maze      your fighter will encounter lots of monsters and treasures.": INK 7
770 PRINT AT 5,0;"BUT!!! when your strength and   combat points face to zero you   will die!!!": INK 5
771 PRINT AT 9,0;"When a magic potion is found and used in battle it will take 20 points off the other monster's combat(unless in a tight spot it should be saved for the wizard.": INK 3
772 PRINT AT 21,0;"Press any key to continue"
773 IF INKEY$="" THEN GO TO 773
775 CLS
780 PRINT AT 0,0;"Sometimes chests appear.They     contain treasures traps and      weapons."
790 PRINT PAPER 6; INK 0;AT 5,0;"In rooms some things are hidden These things can be found by    looking."
800 BEEP .1,0: PRINT FLASH 1;"Here are the controls:-"
810 PRINT "N-----------move North"
811 PRINT "S-----------move South"
812 PRINT "W-----------move West"
813 PRINT "E-----------move East"
814 PRINT "R-----------for a rest"
815 PRINT "F-----------for a punch up"
816 PRINT "M-----------to use a magic spell"
817 PRINT "L-----------to Look more closely"
820 PRINT AT 21,0;"Press any key to play"
830 IF INKEY$="" THEN GO TO 830
840 GO TO 10
999 STOP
1000 FOR x=70 TO 175 STEP 2
1005 BEEP .01,x-130
1010 PLOT 0,x: DRAW 160,0
1020 NEXT x
1030 FOR x=175 TO 70 STEP -2
1035 BEEP .01,x-130
1040 PLOT 0,x: DRAW 160,0
1050 NEXT x
1052 BORDER 1: PAPER 1: INK 7: CLS
1053 IF key=1 THEN PRINT AT 0,0;"You found the key but not the exit!!!": GO TO 1062
1055 PRINT AT 0,0;"The wizard lives to fight "
1056 PRINT AT 1,0;"another day"
1060 LET xx=USR 65153: PRINT AT 6,13;"AB";AT 7,13;"CD";AT 8,13;"EF";AT 9,13;"GH";AT 9,13;"IL";AT 10,13;"JK"
1062 PRINT AT 21,0;"Press any key to play again"
1070 IF INKEY$="" THEN GO TO 1070
1080 GO TO 2
1100 LET xx=USR 65153: PRINT AT 6,13;"AB";AT 7,13;"CD";AT 8,13;"EF";AT 9,13;"GH";AT 9,13;"IL";AT 10,13;"JK"
2000 CLS : FOR g=1 TO 4: LET xx=USR 64563: FOR x=1 TO 3
2010 FOR h=1 TO 7
2020 BORDER h: PAPER h
2025 PRINT INK h-1;"UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU"
2030 NEXT h
2040 NEXT x
2045 PRINT AT 0,0;
2050 LET xx=USR 64763: FOR x=1 TO 3
2060 FOR h=1 TO 7
2070 BORDER h: PAPER h
2080 PRINT INK h-1;"SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS"
2090 NEXT h
2100 NEXT x
2110 PRINT AT 0,0;
2120 NEXT g
2130 INK 0
2140 PRINT AT 0,0;"QQQQQQQQQQQWELL DONEQQQQQQQQQQQQQ"
2150 PRINT AT 1,0;"QQQQQYOU ESCAPED TO FREEDOMQQQQQ"
2160 GO TO 1062
5000 IF mon=1 THEN LET xx=USR 64753: PRINT AT 8,6;"P";AT 9,5;"Q";AT 10,6;"R": LET monc=8: RETURN
5010 IF mon=2 THEN LET xx=USR 65153: PRINT AT 6,6;"MNOPQ";AT 7,8;"S";AT 8,8;"R": LET monc=7: RETURN
5030 IF mon=3 THEN LET xx=USR 64958: PRINT AT 6,13;"AB";AT 7,13;"CD";AT 8,13;"EF";AT 9,13;"GH";AT 9,13;"IJ";AT 10,13;"KL": LET monc=18: RETURN
5040 IF mon=4 THEN LET xx=USR 64568: PRINT AT 9,6;"AB";AT 10,6;"CD";AT 11,6;"EF": LET monc=16: RETURN
5050 IF mon=5 THEN LET xx=USR 64568: PRINT AT 11,6;"MN": LET monc=5: RETURN
5060 IF mon=6 THEN LET xx=USR 65153: PRINT AT 6,13;"AB";AT 7,13;"CD";AT 8,13;"EF";AT 9,13;"GH";AT 9,13;"IL";AT 10,13;"JK": LET monc=50: RETURN
5070 IF mon=7 THEN LET xx=USR 64568: PRINT AT 9,6;"GH";AT 10,6;"IJ";AT 11,6;"KL": LET monc=18: RETURN
7000 INK 0: PAPER 0: BORDER 0
7010 FOR x=1 TO 10
7020 PRINT AT x+2,21;m$(v)
7022 LET v=v+1
7025 NEXT x: INK 7
7060 RETURN
7900 FOR x=0 TO 17
7910 PRINT AT x,0;"                                "
7920 NEXT x: LET d=0
7930 FOR x=18 TO 21
7940 PRINT AT x,0;"                                "
7950 NEXT x: GO TO 17
8000 RESTORE ((a*10)+9000)+b: REM DOORS
8001 READ door: LET d1=door
8002 READ door: LET d2=door
8003 READ door: LET d3=door
8004 READ door: LET d4=door
8005 READ mon: READ a$
8006 READ i$
8007 READ e
8008 RETURN
8010 READ c
8012 IF e=1 THEN LET t=t+c
8014 IF e=2 THEN LET com=com+4
8016 IF e=3 THEN LET com=com-3
8018 IF e=4 THEN LET com=com-2
8019 IF e=5 THEN LET sp=sp+1
8020 IF e=6 THEN LET t=t+c
8021 IF e=7 THEN LET d4=1
8022 IF e=8 THEN LET d1=1
8023 IF e=9 THEN LET d3=1
8024 IF e=10 THEN LET d2=1
8025 IF e=11 THEN LET st=st+6
8026 IF e=12 THEN LET st=st+8
8027 IF e=13 THEN LET key=1
8090 GO SUB 20
8099 RETURN
8100 PLOT 0,70: DRAW 40,20
8110 DRAW 80,0: DRAW 40,-20
8120 DRAW 0,90: DRAW -40,-20: DRAW -80,0
8130 DRAW 0,-50: DRAW 80,0: DRAW 0,50: DRAW -80,0: DRAW -40,20
8140 DRAW 0,-90
8145 RETURN
8146 REM DOOR2
8150 CIRCLE 75,105,2
8160 PLOT 70,90: DRAW 0,25: DRAW 20,0: DRAW 0,-25
8165 RETURN
8167 REM DOOR1
8170 PLOT 5,73: DRAW 0,35: DRAW 15,-3: DRAW 0,-25
8180 PLOT 10,90: DRAW 0,3,PI/1.5: DRAW 0,-3,PI
8190 RETURN
8195 REM DOOR3
8200 PLOT 155,73: DRAW 0,35: DRAW -15,-3: DRAW 0,-25
8210 PLOT 145,90: DRAW 0,3,PI: DRAW 0,-3,PI/1.5
8220 RETURN
9011 DATA 1,0,0,0,5,"Beware!!!","You find a secret door leading east",5
9012 DATA 1,0,1,1,0,"An empty room","You find gems",6,10
9013 DATA 1,0,0,1,7,"An almost empty room","You find a body",0
9014 DATA 0,0,1,1,0,"An empty room","You find an axe",3
9015 DATA 1,0,1,0,2,"A bat","You find a dead bat",0
9016 DATA 1,0,1,0,0,"An empty chamber","Nothing is found",0
9017 DATA 1,0,1,0,0,"An empty room","Food is found",11
9018 DATA 1,0,1,0,1,"An almost empty room","You find a dead bat",0
9019 DATA 1,0,0,1,0,"An empty room","You find a sword",2
```

(listing 1 continued on next page)

(listing 1 continued from previous page)

```
9020 DATA 0,0,1,0,0,"A dead end"
,"You find gold",1,7
9021 DATA 1,0,1,0,1,"A snake","Y
ou find a dead snake",0
9022 DATA 1,1,0,0,0,"An empty ro
om","You find food",11,8
9023 DATA 0,1,1,0,0,"An empty ro
om","You find wine",12,10
9024 DATA 1,1,1,0,3,"A skeleton"
,"You find a pile of bones",0
9025 DATA 1,0,1,1,0,"An empty ro
om","You find nothing",0
9026 DATA 1,0,1,1,5,"A spider","
You find a dead spider",0
9027 DATA 1,0,1,0,0,"An empty ro
om","You find a dagger",4
9028 DATA 1,0,1,0,0,"An empty ro
om","You find nothing",0
9029 DATA 1,1,0,1,0,"An empty ro
om","You find gems",6,4
9030 DATA 0,0,1,1,4,"A goblin","
You find a dead goblin",0
9031 DATA 1,0,1,0,0,"An empty ro
om","You find food",11
9032 DATA 1,0,0,1,5,"A spider","
You find a dead spider",0
9033 DATA 0,0,1,1,0,"An empty ro
om","You find an axe",3
9034 DATA 1,0,1,0,0,"An empty ro
om","You find gold",1,4
9035 DATA 1,1,1,0,INT (RND*5),"D
anger lurks","You find a dead cr
eature",0
9036 DATA 1,1,0,1,0,"An empty ro
om","You find nothing",0
9037 DATA 0,0,1,0,0,"A dead end"
,"You find a secret door leading
 south",7
9038 DATA 1,0,1,0,4,"An almost e
mpty room","You find a dead gobl
in",0
9039 DATA 1,1,0,1,0,"An empty ro
om","You find an axe",3
9040 DATA 0,1,1,0,0,"An empty ro
om","You find gold",6,8
9041 DATA 1,0,1,0,0,"An empty ro
om","You find gems",6,8
9042 DATA 1,1,1,1,2,"A giant bat
","You find a dead bat",0
9043 DATA 1,1,1,0,1,"A snake","Y
ou find a dead snake",0
9044 DATA 1,0,0,0,0,"A dead end"
,"You find a sword",2
9045 DATA 0,0,1,0,0,"A dead end"
,"You find an axe",3
9046 DATA 1,1,0,1,3,"A skeleton"
,"You find a pile of bones",0
9047 DATA 0,0,0,0,0,"A dead end"
,"You find a door going north",
10
9048 DATA 0,0,1,1,2,"A bat","You
 find a dead bat",0
9049 DATA 1,1,0,0,0,"An empty ch
amber","You find gems",5,4
9050 DATA 0,0,1,1,0,"An empty ro
om","You find a axe",3
9051 DATA 1,0,1,0,0,"An empty ro
om","You find nothing",0
9052 DATA 1,1,1,0,INT (RND*5),"D
anger lurks!","you find a dead c
reature",0
9053 DATA 1,0,1,1,0,"A bare cham
ber","You find gold",1,9
9054 DATA 1,0,1,0,1,"A snake","Y
ou find a dead snake",0
9055 DATA 1,0,1,1,0,"A bare cham
ber","You find wine",12
9056 DATA 1,1,0,0,2,"A bat","You
 find a dead bat",0
9057 DATA 0,0,1,0,0,"An empty ro
om","You find a gold",1,7
9058 DATA 1,1,1,0,0,"An empty ro
om","You find nothing",0
9059 DATA 1,0,0,0,7,"An almost e
mpty room","You find a dead body
",0
9060 DATA 0,1,1,0,7,"Danger lurk
s!","You find gold",6,4
9061 DATA 1,0,0,1,0,"An empty ro
om","You find nothing",0
9062 DATA 0,0,1,1,0,"An empty ch
amber","You find gems",6,5
9063 DATA 1,1,1,0,7,"A cloaked f
ighter","You find a dead body an
d take  his riches",1,15
9064 DATA 1,0,1,0,0,"An empty ro
om","You find food",11
9065 DATA 1,1,0,1,2,"A bat","You
 find a dead bat",0
9066 DATA 0,0,1,1,0,"An empty ro
om","You find nothing",0
9067 DATA 0,0,1,0,0,"An empty ro
om","You find gold",1,8
9068 DATA 1,0,0,1,4,"A Goblin","
You find a dead goblin",0
9069 DATA 0,0,0,0,0,"A dead end"
,"You find a door going south",7
9070 DATA 0,0,1,0,4,"A goblin ",
"You find a dead goblin and take
 his gold",1,5
9071 DATA 1,1,1,1,0,"An empty ro
om","You find gems",6,5
9072 DATA 1,1,0,0,0,"An empty ro
om","You find a secret door lead
ing  south",7
9073 DATA 0,0,0,1,0,"A dead end"
,"You find an axe",3
9074 DATA 0,0,1,0,0,"A dead end"
,"You find gold",1,5
9075 DATA 1,1,0,1,0,"An empty ro
om","You find nothing",0
9076 DATA 0,1,1,1,3,"A skeleton"
,"You find a pile of bones",0
9077 DATA 1,0,0,0,0,"A dead end"
,"You find a food",11
9078 DATA 0,1,1,1,0,"A bare room
","You find gems",6,7
9079 DATA 1,0,0,0,0,"A dead end"
,"You find a door going north",1
0
9080 DATA 0,0,1,1,0,"Another alm
ost bare room","Nothing is found
",0
9081 DATA 1,1,0,0,0,"Another bar
e room","You find a bottle conta
ining a  magic spell",5
9082 DATA 0,0,1,1,0,"An empty ro
om","You find a secret door lead
ing  north",10
9083 DATA 1,1,1,0,3,"A skeleton"
,"You find a heap of bones",0
9084 DATA 1,0,0,1,0,"An empty ro
om","You find gems",6,5
9085 DATA 0,1,1,0,4,"A goblin","
You find a dead goblin",0
9086 DATA 1,1,1,0,0,"An empty ch
amber","You find a gold",1,4
9087 DATA 1,0,0,1,1,"A snake","Y
ou find a dead snake",0
9088 DATA 0,1,1,1,0,"A bare room
","You find nothing",0
9089 DATA 1,0,0,1,5,"A giant spi
der","You find a dead spider",0
9090 DATA 0,1,0,1,0,"Another emp
ty room","You find gold",1,6
9091 DATA 0,0,1,1,0,"Yet another
 bare room","You find a sword",2
,4
9092 DATA 1,1,1,1,1,"A snakes la
ir!","You find a dead snake",0
9093 DATA 1,0,0,1,0,"An empty ro
om","You find nothing",0
9094 DATA 0,1,0,1,INT (RND*5),"D
anger lurks","You find a dead cr
eature",0
9095 DATA 0,0,1,1,0,"An empty ro
om","you find gems",6,7
9096 DATA 1,0,0,1,INT (RND*5),"d
anger lurks","you find a dead cr
eature",0
9097 DATA 0,1,1,0,0,"A bare cham
ber","You find an axe",3
9098 DATA 1,1,0,1,0,"A bare room
","You find food",11
9099 DATA 0,1,0,0,0,"A bare room
","You find gems",6,10
9100 DATA 0,1,1,0,0,"An empty ro
om","Nothing is found",0
9101 DATA 1,1,0,0,0,"An empty ro
om","You find gold",1,4
9102 DATA 0,1,0,0,0,"A dead end"
,"You find nothing",0
9103 DATA 0,1,1,0,2,"A giant bat
","You find a dead bat",0
9104 DATA 1,1,1,0,0,"A bare cham
ber","You find a dagger",4
9105 DATA 1,1,0,0,5,"A giant spi
der","You find a dead spider",0
9106 DATA 0,1,1,0,0,"An empty ch
amber","You find food",11
9107 DATA 1,0,0,0,0,"An empty ro
om","You find a secret door lead
ing  east",9
9108 DATA 0,1,1,0,0,"An empty ch
amber","You find a secret door l
eading  west",3
9109 DATA 1,0,0,0,6,"The WIZARD!
","You find a key on the wizard"
,13,13
9910 LET xx=USR 64700
9911 LET m$(1)= "KMGHCDOOOH"
9915 LET m$(2)= "MOIJFGGOOE"
9920 LET m$(3)= "COMCOFEMOE"
9925 LET m$(4)= "JOAFKMESCI"
9930 LET m$(5)= "COFGOGIMFK"
9935 LET m$(6)= "JHCFOECOHS"
9940 LET m$(7)= "MAIDMEBKBK"
9945 LET m$(8)= "CICFHJFMBH"
9950 LET m$(9)= "NCAHNCHJEL"
9955 LET m$(10)="JILJFIJKJK"
9956 RETURN
9960 LET xx=USR 64763: PRINT OVE
R 1;AT a+2,b+21;"T"
9970 RETURN
```

Listing 2.

```
64568: 01A8002E1FC1158 = 640
64576: FFEDB0C9C001A800 = 1035
64584: 1151FC2158FFEDE0 = 1139
64592: C907030F10361511 = 334
64600: 080080F2036CA8E8 = 796
64608: 103348A7909FC8F4 = 973
64616: A4CC12E509F91963 = 997
64624: 8DA7818FA4E71873 = 1815
64632: F8996988494CF303C = 1031
64640: 3F03040A03050810 = 123
64648: 3EC0205010A05088 = 822
64656: 7C30087B686CEFEB = 1046
64664: E8301C1E1636F7D7 = 858
64672: 17F9EADAEA3ADE3E = 1092
64680: 7E9F575E575C707C = 678
64688: 7E071F67409079320 = 690
64696: 20E0F8E6B2E90504 = 1346
64704: 04201008 3E7D70A = 430
64712: 10007C42427C4040 = 536
64720: 00003C4242524A3C = 408
64728: 00007C42427C4442 = 514
64736: 00003C403C02423C = 312
64744: 0000FE1010101010 = 334
64752: 000042424242423C = 390
64760: 0000000148002114 = 222
64768: FD1158FFEDB0C900 = 1227
64776: 01A8002158FF1114 = 582
64784: FCEDB0C9E7818100 = 1355
64792: 008181E7E7818180 = 1105
64800: 808181E7FF818180 = 1253
64808: 808181E7FF818181 = 1259
64816: 818181E7E7818101 = 1103
64824: 018181E7E7818100 = 979
64832: 008181FFFF818100 = 1025
64840: 008181E7FF818101 = 1003
64848: 018181E7E7818101 = 980
64856: 018181FFE7818180 = 1131
64864: 808181FFFF818101 = 1155
64872: 018181FFE7818181 = 1132
64880: 818181FFFF818180 = 1283
64888: 808181FFE7818181 = 1259
64896: 818181E7FF818100 = 1131
64904: 008181FF3C5ABD99 = 1006
64912: 4242424242124848 = 420
64920: 90909669ADB5A992 = 1260
64928: 8264180FF818181 = 895
64936: 818181FF00181866 = 792
64944: 1824420088552200 = 381
64952: 5500EEEB000001A8 = 679
64960: 0021D7FD1158FFED = 1058
64968: B0C90001A8002158 = 667
64976: FF11D7FDEDB0C903 = 1357
64984: 070D0F07020301C0 = 240
64992: E080F0E043C58A63 = 1385
65000: BCB1AEB3AEA54A94 = 1279
65008: 6E55A54DB58D72A5 = 1038
65016: DA743916211E0C05 = 490
65024: 8D758D7696670A79 = 901
65032: 443E1C141414149E = 393
65040: 22DC382828282814 = 190
65048: 1414140814141428 = 168
65056: 2828281028282014 = 270
65064: 1414141414 6CEA28 = 482
65072: 2828282828365740 = 405
65080: 44446330180C0702 = 328
65088: 2323C60C1830E001 = 577
65096: 020408103F60FF00 = 144
65104: 00020102FC06FF21 = 549
65112: 42850A142850A0C0 = 701
65120: 8000000000000044 = 196
65128: AE44007 2A8532300 = 542
65136: 000000003F408000 = 255
65144: 00000000FC0A1100 = 279
65152: 0001A8002199FE11 = 526
65160: 58FFEDB0C901A800 = 1126
65168: 2158FF1199FEEDB0 = 1213
65176: C903060C1A13191A = 323
65184: 0FC0603058189858 = 703
65192: F0073841818090 90 = 916
65200: 90E0DC8281010913 = 876
65208: 1390909050505050 = 771
65216: 501C1B2521121 20C = 254
65224: 007090A8C8805020 = 900
65232: 0808080804040404 = 48
65240: 0202081010102020 = 130
65248: 2020180700000000 = 95
65256: 00010638C0000000 = 255
65264: 0002020202010101 = 11
65272: 0100003CC3511A0C = 391
65280: 030619A040061960 = 385
65288: 8024428181818103 = 941
65296: 2460980502609806 = 545
65304: 0100003CC3865830 = 526
65312: C00000C3A55A3C24 = 738
65320: 1830662400000000 = 222
65328: 000000003CC30000 = 255
65336: 0000000000000000 = 0
65344: 00019D594C38C057 = 656
65352: 710EE605CD05C61E = 800
65360: 2F75761B023130 03E = 393
65368: 003C42127E424200 = 450
65376: 007C427C42427C00 = 570
65384: 003C421040423C00 = 380
65392: 0078444242417E00 = 508
65400: 007E407C40407E00 = 568
65408: 007E407C40404000 = 506
65416: 003C42404E423C00 = 394
65424: 0042427E42424200 = 456
65432: 003E0808080 83E00 = 156
65440: 0002020242423C00 = 198
65448: 0044487048444200 = 458
65456: 004040404040 7E00 = 446
65464: 0042665A42424200 = 456
65472: 004262524A464200 = 456
65480: 003C424242423C00 = [illegible]
65488: 007C42427C404000 = 508
65496: 003C4242524A3C00 = 408
65504: 007C42427C444200 = 514
65512: 003C403C02423C00 = 312
65520: 00FE101010101000 = 334
65528: 004242424242 3C00 = 390
```

Listing 3.

```
 10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
 20 INPUT "Start ";s
 30 INPUT "Finish ";f
 40 FOR n=s TO f STEP 8
 50 LET tot=0: PRINT n;": ";
 60 INPUT h$: PRINT h$;
 70 LET x=0
 80 FOR b=1 TO LEN h$ STEP 2
 90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 60
 150 NEXT n
 160 REM enter STOP to stop
```

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Micro Power	165	KILLER GORILLA	7.95	4.69
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Superior	171	STARSTRIKER	7.95	3.99
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Superior	280	SPACE PILOT	7.95	3.79
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Quicksilva	38	FRED	7.95	4.29
Quicksilva	39	TRAFFIC	7.95	4.29
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Terminal	43	SUPERSKRAMBLE	7.95	3.79
Terminal	44	TOURNAMENT	7.95	3.79
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Bug Byte	227	TWIN KINGDOM VALLEY	9.50	4.29
Interceptor	228	HEROES OF KARN	7.00	3.79
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Micro Power	231	CYBERTRON MISSION	6.95	3.29
Micro Power	232	FELIX IN THE FACTORY	6.95	4.19
Micro Power	233	GHOULS	6.95	4.19
Micro User	234	OLYMPICS	6.00	2.99
Ocean	236	CAVELON	6.90	3.29
Ocean	237	CHINESE JUGGLER	6.90	3.29
Ocean	239	HUNCHBACK	6.90	3.29
Romik	240	DICKY'S DIAMONDS	6.99	3.29
Romik	242	THE GREAT NORDIC WAR	8.99	4.29
Terminal	243	LAZY JONES	7.95	3.99
Terminal	244	PLUMBCRAZY	7.95	3.99
Terminal	245	STAR COMMANDO	7.95	3.99
Thor	246	JACK & THE BEANSTALK	7.95	3.99
Visions	247	1994	6.95	3.29
Visions	248	DARE DEVIL DENNIS	7.95	3.99
Visions	249	SNOOKER	8.95	4.29
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Anirog	283	PC FUZZ	7.95	3.79
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Artic	285	HUMPTY IN THE GARDEN	6.95	4.25
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Superior	290	MR WIZZ	7.95	3.79
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Interceptor	110	WUNDA WALTER	6.00	3.19
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Quicksilva	114	TORNADO	5.95	3.19
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CDS	67	WINGED WARLORDS	5.95	2.99
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CRL	69	AHHH !!!	5.95	3.39
CRL	70	GLUG GLUG	5.95	3.39
CRL	71	HANDICAP GOLF	5.95	3.39
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Imagine	82	BC BILL	5.50	2.59
Imagine	83	COSMIC CRUISER	5.50	2.59
Imagine	84	JUMPING JACK	5.50	2.59
Imagine	85	PEDRO	5.50	2.59
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Ocean	91	ESKIMO EDDIE	5.90	2.99
Ocean	93	MOON ALERT	5.90	2.99
Phoenix	94	JOKERS WILD	6.99	3.29
Quicksilva	95	ANT ATTACK	6.95	3.79
Quicksilva	96	BOOGABOO THE FLEA	6.95	3.79
Quicksilva	97	DRAGONSTANE	6.95	3.79
Quicksilva	98	FRED	6.95	3.79
Quicksilva	99	LASERZONE	6.95	3.79
Quicksilva	100	SNOWMAN	6.95	3.79
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Bug Byte	199	STAR TRADER	6.95	3.79
Bug Byte	200	TWIN KINGDOM VALLEY	7.95	4.19
Digital	201	FIGHTER PILOT	7.95	4.19
Digital	202	NIGHT GUNNER	5.95	3.79
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Durell	204	SCUBA DIVE	5.95	2.99
Imagine	205	STONKERS	5.50	2.59
Interceptor	206	FOREST AT WORLD'S END	5.50	2.99
Interceptor	207	TILER	5.50	2.99
Kenar	208	TURBO CHESS	5.95	2.99
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ROBOT *competition* RESULT

At last we can reveal the winners of our competition for a £1,100 Maplin Hero Jnr robot.

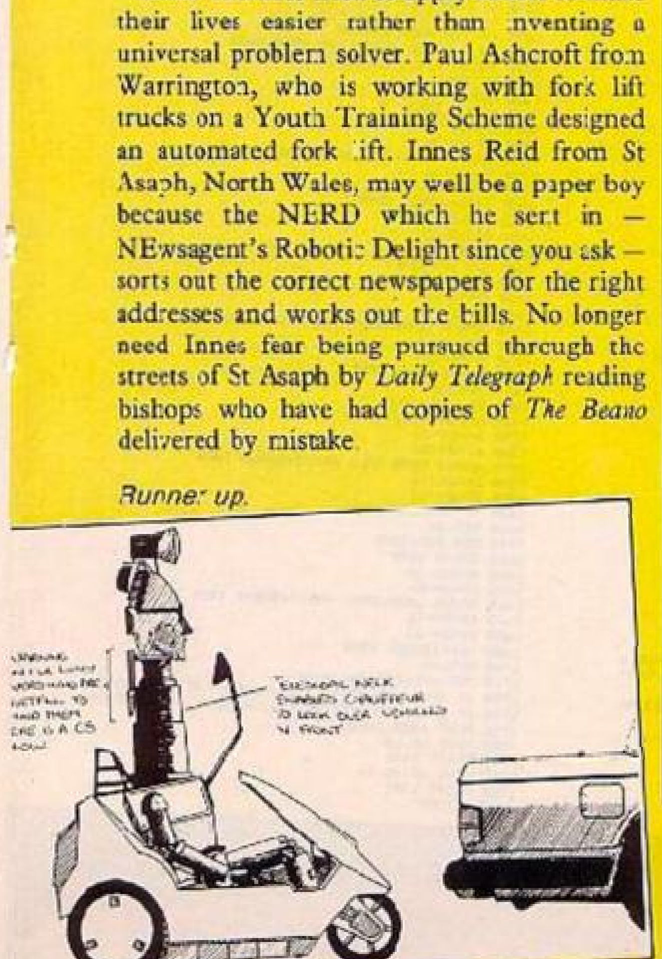
EITHER THE EXCITEMENT of winning a real live robot has gone to your heads or you know something which would turn Fleet Street gossip columnists green with envy.

A surprisingly large number of entries — including an iron lady from Graham Swankie — looked like a cross between Margaret Thatcher and a Dalek. No wonder they're giving Dr Who a break. Industrial action in the schools is also having an affect. The Education Secretary appears in the shape of a mechanical hedgehog sent in by Fergus Henderson of Edinburgh — Keith Joseph's Mechanical Replacement for Striking Teachers.

Sir Clive's name was also taken in vain with numerous designs for Sinclairdroids. One from Graham Inglis featured "lifelike skin and hair — perfected after years of making keyboards" and an unusual delivery system "if you live within 15 miles the droid will send himself". But the most lifelike android featured in a photograph sent in by R Bosman of Enschede in the Netherlands. The Bosmanoid has specially designed big ears for picking up data.

Some entrants tried to apply robots to make their lives easier rather than inventing a universal problem solver. Paul Ashcroft from Warrington, who is working with fork lift trucks on a Youth Training Scheme designed an automated fork lift. Innes Reid from St Asaph, North Wales, may well be a paper boy because the NERD which he sent in — NEwsagent's Robotic Delight since you ask — sorts out the correct newspapers for the right addresses and works out the bills. No longer need Innes fear being pursued through the streets of St Asaph by *Daily Telegraph* reading bishops who have had copies of *The Beano* delivered by mistake.

Runner up.



Winner.

Runner up.

Other practical robot ideas included Guy Culverwell's tour guide, which could perhaps take him from his native Kent to Switzerland where Andreas Weder is working on an automatic film director — based on a BBC of course. The Lally brothers from Bromsgrove sent in a sketch of IGOR, a solar-powered unmanned glider which could be used by the police to monitor traffic or with a laser to guide in bombs — that should put a stop to illegal parking. Even more terrifying was the mobile dentist which Michael Dobson plans to unleash on Loughborough. Derek Baigent of Guildford thought up a robot guide dog for the blind which could have safe routes to useful destinations in its memory.

If we were awarding the prizes for effort it would be a close race between the 40-page essay submitted by CW Judge of Ashford, Kent and the 12 feet of circuit diagrams and specifications sent in by two Yugoslav 17-year olds Maksim Rudolf and Radovan Serviec of Ljubljana.

But after much consultation the runners-up who each win a Maplin Zero II mini turtle are Juan Jose Casenave Clemente of Madrid in Spain for his Electronic Taxi Driver and the anonymous individual who sent in a C5 Chauffeur. The Taxi Driver which has a coin slot and a credit card slot finds its own way around the streets while the C5 Chauffeur needs a telescopic neck to keep a look out for homicidal truck drivers — and presumably malfunctioning robot taxis. Now all you need to do is get in touch with us to claim your prize — we know your handwriting.

The winner of the £1,000 Hero robot is Guy Taylor of Bristol for his very topical idea for an automatic crowd controller and entertainer at football matches called Rainbow. Unlike Chelsea's Ken Bates Rainbow doesn't believe that ritual electrocution will bring the fans flocking back to football stadiums — Rainbow has lasers but strictly for entertainment rather than zapping hooligans. A suction arm of this big-budget vacuum cleaner clears rubbish from the stands. In extremes it can call on water cannon which can be reversed to help dry off waterlogged pitches.

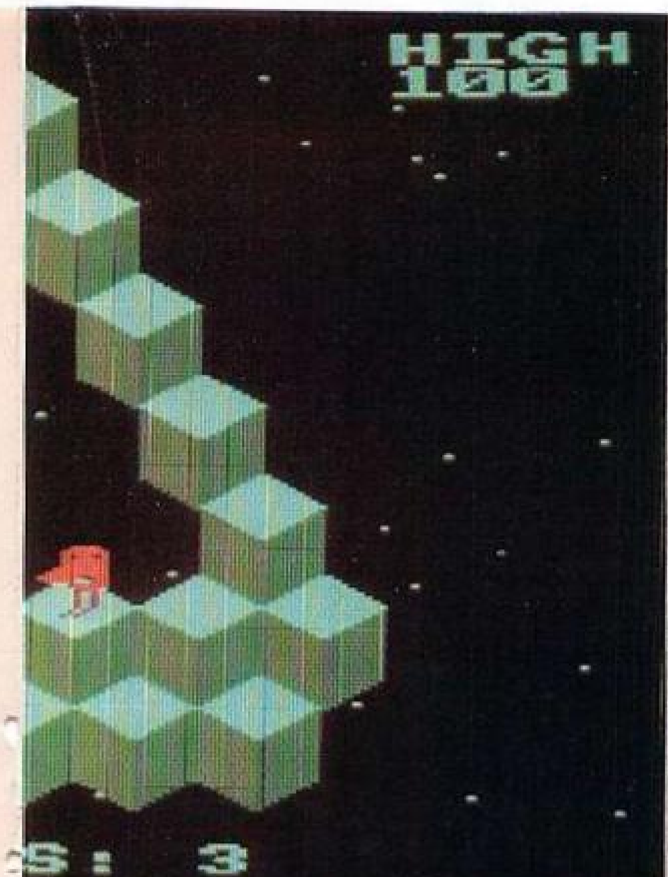
HERE IS a rare creature to find in the pages of *Your Computer* — a main game written in Basic. No multiple listings, no complicated saving instructions, no hex loader, and not an ounce of machine code — Englebert is 100 per cent pure Basic. Key it in, save it and Run.

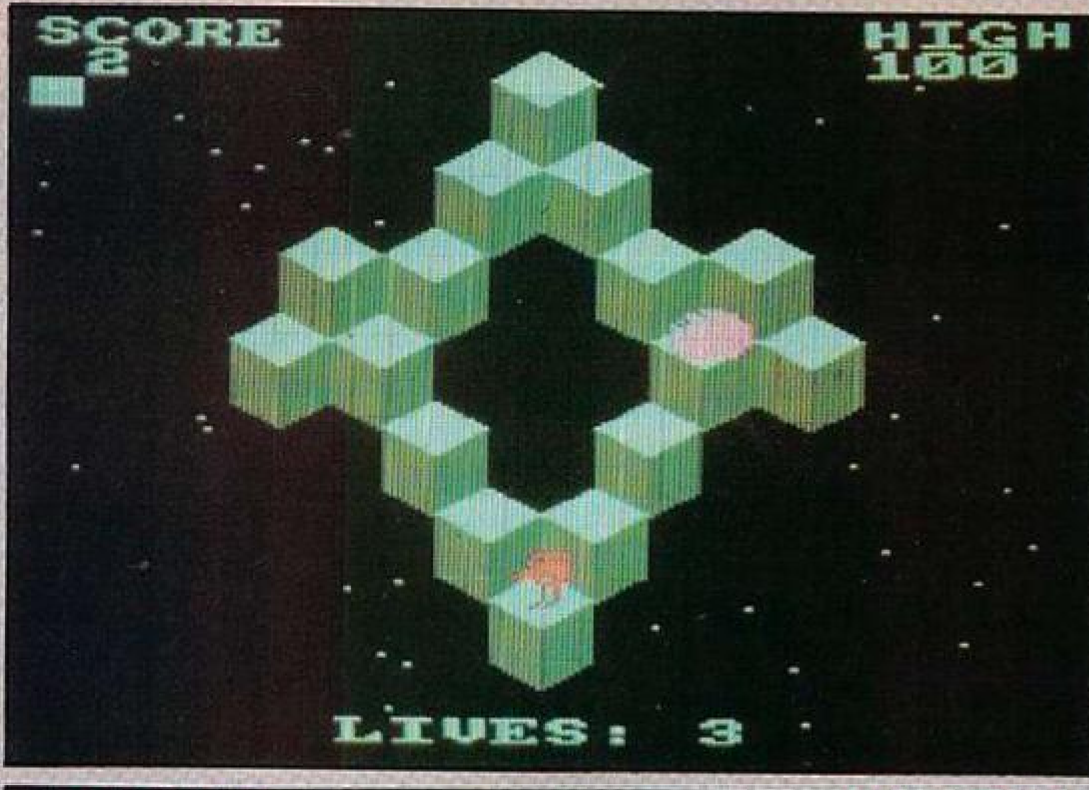
You will be rewarded with a fast moving, high-quality arcade game, which gives a good

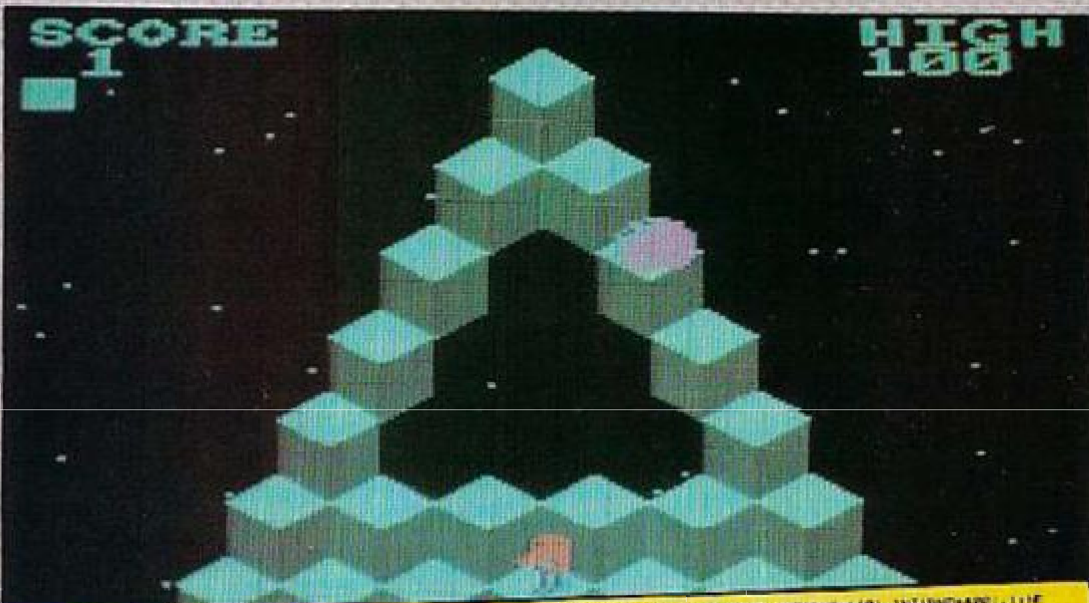
John Kennedy with a fast and colourful Basic game for the Amstrad.

ENGLI

```
10 REM ++++++++++++++++++
20 REM +++ Englebert +++
30 REM +J.Kennedy  1985+
40 REM ++++++++++++++++++
50 REM
60 INK 0,0:BORDER 0
70 ENT -1,1,5,1
80 ENT -2,1,10,5
90 ENT -3,10,10,1,,0,-12,1
100 ENV 1,15,-1,2
110 ENV 2,15,-1,10
120 ENV 3,15,-1,30
130 GOSUB 1000
140 hi=100
150 DIM bx(5),by(5)
160 DIM sh$(6),ts(6)
170 DIM nx(5),ny(5),ox(5),oy(5)
180 REM read in sheet data
190 RESTORE 2600
200 FOR sh=1 TO 6
210 READ ts(sh)
220 READ x,y
230 IF x=99 THEN GOTO 260
240 sh$(sh)=sh$(sh)+CHR$(x)+CHR$(y)
250 GOTO 220
260 NEXT sh
270 INK 1,20:INK 2,,3:INK 3,10
280 GOSUB 2810
290 GOSUB 3160
300 sc=0:li=5
310 sh=1
320 num=0
330 GOSUB 3000
340 RESTORE 360
350 FOR I=1 TO 15:READ COL:INK I,COL:NEXT I
360 DATA 20,13,18,17,17,17,17,6,11,17,17,7,7,7,7
370 FOR A=1 TO 50:PLOT INT(RND*639),INT(RND*380),1:NEX
T A
380 x=11
390 TAGOFF
400 y=2
410 wee=0
420 PRINT CHR$(22);CHR$(1)
430 FOR q=1 TO LEN (sh$(sh)) STEP 2
440 x=ASC(MID$(sh$(sh),q,1))
450 y=ASC(MID$(sh$(sh),q+1,1))
460 GOSUB 520
470 NEXT q
480 REM print sheet
490 REM
500 PRINT CHR$(22);CHR$(0)
510 GOTO 750
520 REM print cube at x,y
530 LOCATE x,y
540 PEN 1
550 PRINT CHR$(214);CHR$(215)
560 LOCATE x,y+1
570 PRINT CHR$(213);CHR$(212)
580 PEN 2
590 LOCATE x,y+1
600 PRINT CHR$(215);
610 PEN 3
620 PRINT CHR$(214)
630 LOCATE x,y+2
640 PEN 2
650 PRINT CHR$(143);
660 PEN 3
670 PRINT CHR$(143);
680 LOCATE x,y+3
690 PEN 2
700 PRINT CHR$(213);
710 PEN 3
720 PRINT CHR$(212);
730 PEN 1
740 RETURN
750 REM Program
760 FOR N=-15 TO 15
770 SOUND 1,ABS(N)*10,5,15,0,0,ABS(N)
780 NEXT N
790 wh=0
800 tot=0
810 LOCATE 1,1
820 PRINT "SCORE"
830 LOCATE 17,1
840 PRINT "HIGH";
850 LOCATE 16,2
860 PRINT hi;
870 LOCATE 7,25:PRINT "LIVES:";li;
880 PRINT CHR$(23);CHR$(1)
890 TAG
900 QX=294:QY=108:QD=1
910 FOR q=0 TO 5:bx(q)=294:by(q)=388:NEXT q
920 Q1$=CHR$(246)+CHR$(247)
930 Q2$=CHR$(248)+CHR$(249)
940 b1$=CHR$(250)+CHR$(251)
950 b2$=CHR$(252)+CHR$(253)
960 fl=1:GOSUB 1090
970 cl=0
980 dead=0
990 REM MAINLOOP
1000 GOSUB 1180
1010 GOSUB 1930
1020 GOSUB 2440
1030 IF fl=1 OR dead=1 THEN GOTO 330
1040 GOSUB 1180
1050 GOSUB 2440
1060 IF fl=1 OR dead=1 THEN GOTO 330
1070 IF clf=1 THEN GOTO 2300
1080 GOTO 1000
1090 REM PRINT/ERASE
1100 PLOT 1000,1000,15
1110 IF fl=1 AND TEST(qx+20,qy-31)=1 THEN PLOT qx+20,q
y-31,,3:PLOTR 5,0:tot=tot+1:sc=sc+1:GOSUB 2390:IF tot=
ts(sh) THEN clf=1
1120 IF wee=0 AND TEST(qx+12,qy-32)=0 THEN GOSUB 2170:
RETURN
1130 MOVE QX,QY
1140 PRINT Q1$;
1150 MOVE QX,QY-16
1160 PRINT Q2$;
1170 RETURN
1180 REM MOVE
1190 N=0
1200 J=JOY(0)
1210 IF (J AND 1)=1 AND (J AND 4)<>0 THEN N=1
1220 IF (J AND 1)=1 AND (J AND 8)<>0 THEN N=2
1230 IF (J AND 2)=2 AND (J AND 4)<>0 THEN N=3
1240 IF (J AND 2)=2 AND (J AND 8)<>0 THEN N=4
1250 IF INKEY(69)<>-1 THEN n=1
1260 IF INKEY(71)<>-1 THEN n=4
1270 IF INKEY(37)<>-1 THEN n=2
1280 IF INKEY(38)<>-1 THEN n=3
1290 IF N=0 THEN RETURN
1300 ON n GOSUB 1330,1440,1530,1620
1310 SOUND 4,0,2,10,4,0,3
1320 RETURN
1330 REM UP/LEFT
1340 GOSUB 1090
1350 QX=QX-16
1360 QY=QY+24
1370 GOSUB 1090:CALL &BD19:GOSUB 1090
1380 QX=QX-16
1390 QY=QY+24
1400 fl=1:GOSUB 1090
1410 RETURN
1420 QX=QX-16
1430 QY=QY-24
1440 REM UP/RIGHT
1450 GOSUB 1090
1460 QX=QX+16
1470 QY=QY+24
1480 GOSUB 1090:CALL &BD19:GOSUB 1090
1490 QX=QX+16
1500 QY=QY+24
1510 fl=1:GOSUB 1090
1520 RETURN
1530 REM DN/LEFT
1540 GOSUB 1090
1550 QX=QX-16
1560 QY=QY-24
1570 GOSUB 1090:CALL &BD19:GOSUB 1090
1580 QX=QX-16
1590 QY=QY-24
1600 fl=1:GOSUB 1090
1610 RETURN
1620 REM DN/RIGHT
1630 GOSUB 1090
1640 QX=QX+16
1650 QY=QY-24
1660 GOSUB 1090:CALL &BD19:GOSUB 1090
1670 QX=QX+16
1680 QY=QY-24
1690 fl=1:GOSUB 1090
1700 RETURN
1710 REM print/erase ball
1720 IF er=1 AND TEST(xb+24,yb-24)<>5 THEN RETURN
1730 IF pr=1 AND TEST(xb+24,yb-24)=5 THEN RETURN
1740 PLOT 1000,1000,4
1750 MOVE xb,yb
1760 PRINT b1$;
1770 MOVE xb,yb-16
1780 PRINT b2$;
1790 RETURN
```







demonstration of the speed of Amstrad's Locomotive Basic — it is fast enough to achieve effects that are only possible in machine code on other machines.

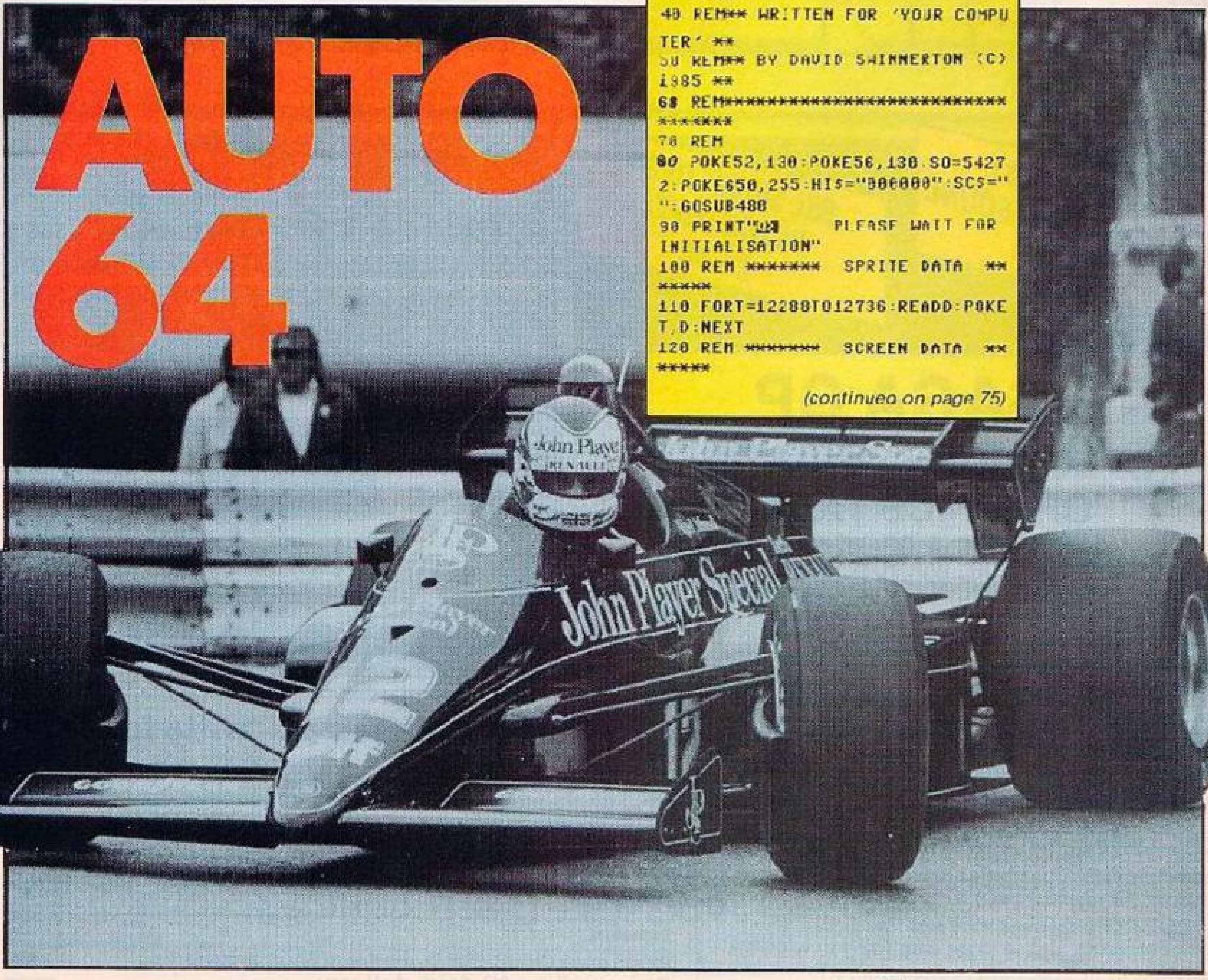
Englebert is a variation on the Q-bert theme. The object is to jump around a pyramid of blocks leaving footprints as you go. If you clear the sheet, by covering the pyramid completely, a new pattern of blocks will appear. If you jump off the pyramid, or if you are hit by the squashy ball thing, you loose a life. At higher levels there are two squashy balls to cope with.

EBERT

```
1000 REM udg
1010 REM Squashy things
1020 SYMBOL 250,3,3,13,13,19,47,47,47
1030 SYMBOL 251,0,192,240,240,240 252,252,252
1040 SYMBOL 252,63,63,63,63,31,31,31,15
1050 SYMBOL 253,252,252,252,252,240,240,240
1060 REM Englebert
1070 SYMBOL 246,3,7,3,7,7,15,31,63
1080 SYMBOL 247,192,224,160,224,224,224,224,96
1090 SYMBOL 248,32,3,1,1,1,1,1,2
1900 SYMBOL 249,96,224,192,64,64,64,64,128
1910 REM /2/69/76/74/70/73/71/65/82/89
1920 RETURN
1930 REM BALL mover
1940 FOR q=0 TO num
1950 IF INT(RND*2)=0 THEN GOTO 1980
1960 IF TEST(bx(q)-16,by(q)-60)>0 OR by(q)=100 THEN di
r=-32 ELSE GOTO 1980
1970 GOTO 1990
1980 IF TEST(bx(q)+60,by(q)-60)>0 OR by(q)=100 THEN di
r=+32 ELSE GOTO 1960
1990 rx(q)=bx(q):ry(q)=by(q)
2000 by(q)=by(q)-48
2010 bx(q)=bx(q)+dir
2020 IF by(q)=52 THEN by(q)=380:bx(c)=291:SOUND 130,50
0,0,15,2,7,0
2030 nx(q)=bx(q):ny(q)=by(q)
2040 NEXT q
2050 er=1:pr=0
2060 FOR q=0 TO num
2070 xb=ox(q):yb=oy(q)
2080 GOSUB 1710
2090 NEXT
2100 er=0:pr=1
2110 FOR q=0 TO num
2120 xb=nx(q):yb=ny(q)
2130 GOSUB 1710
2140 SOUND 130,800+(q*200)+(dir*4),0,15,1,1,0
2150 NEXT
2160 RETURN
2170 REM Englebert falls
2180 IF dead=1 THEN RETURN
2190 dead=1
2200 INK 12,0:INK 13,13:INK 14,20
2210 SOUND 129,200,0,15,3,1,0
2220 SOUND 1,0,0,15,1,0,5
2230 FOR r=qy TO 0 STEP -12
2240 qy=r
2250 wee=1:f1=0
2260 GOSUB 1090:CALL &BD19:GOSUB 1090
2270 NEXT r
2280 FOR t=1 TO 800:NEXT t
2290 f1=0:wee=0:GOTO 2560
2300 REM Cleared pryamid
2310 DI
2320 FOR a=-500 TO 500 STEP 20
2330 SOUND 1,ABS(a)+50,10,15,0,1
2340 NEXT a
2350 [illegible]
2360 IF sh=7 THEN [illegible]
2370 GOTO 330
2380 REM print score
2390 TAGOFF
2400 LOCATE 1,2
2410 PRINT sc
2420 TAG
2430 RETURN
2440 REM check for contact
2450 f1=0
2460 FOR w=0 TO num
2470 IF qx=bx(w) AND qy-8=by(w) THEN f1=1
2480 NEXT w
2490 IF f1=0 THEN RETURN
2500 REM DEAD (SQUASHED)
2510 MOVE qx-8,qy+16:PRINT "[illegible]"
2520 FOR c=1 TO 20
2530 SOUND 1,1000+INT(RND*500),0,1,1
2540 NEXT c
2550 SOUND 1,2000,0,15,1,1,5
2560 li=li-1:IF li<>0 THEN RETURN
2570 TAGOFF
2580 PRINT CHR$(22)+CHR$(1)
2590 PEN 4
2600 INK 4,5,20
2610 IF sc>hi THEN hi=sc
2620 LOCATE 7,12:PRINT "GAME OVER"
2630 PEN 1
2640 PRINT CHR$(22)+CHR$(0)
2650 IF INKEY$<>"" THEN 2650
2660 IF INKEY$="" THEN 2660
2670 GOTO 300
2680 REM sheet data
2690 DATA 28
2700 DATA 10,2,9,5,11,5,8,8,10,8,12,8,7,11,9,11,11,11,
13,11,6,14,8,14,10,14,12,14,14,14,5,17,7,17,9,17,11,17
,13,17,15,17,4,20,6,20,8,20,10,20,12,20,14,20,16,20,99
,99
2710 DATA 16
2720 DATA 10,2,9,5,11,5,6,8,8,8,12,8,14,8,5,11,7,11,13
,11,15,11,8,14,12,14,9,17,11,17,10,20,99,99
2730 DATA 30
2740 DATA 10,2,9,5,11,5,8,8,12,8,7,11,13,11,6,14,14,14
,5,17,7,17,9,17,11,17,13,17,15,17,8,20,10,20,12,20,6,2
0,14,20,99,99
2750 DATA 20
2760 DATA 6,2,8,2,10,2,12,2,14,2,7,5,9,5,11,5,13,5,8,8
,10,8,12,8,9,11,11,11,10,14,9,17,11,17,8,20,10,20,12,2
0,99,99
2770 DATA 32
2780 DATA 10,2,9,5,11,5,8,8,12,8,7,11,13,11,6,14,14,14
,5,17,7,17,9,17,11,17,13,17,15,17,4,20,6,20,8,20,10,20
,12,20,14,20,16,20,99,99
2790 DATA 40
2800 DATA 6,2,8,2,10,2,12,2,14,2,7,5,9,5,11,5,13,5,5,8
,6,8,8,8,10,8,12,8,14,8,16,8,5,11,7,11,9,11,11,11,13,1
1,15,11,6,14,8,14,10,14,12,14,14,14,16,14,5,17,7,17,9,
17,11,17,13,17,15,17,4,20,8,20,10,20,12,20,14,20,16,20
,99,99
2810 REM title screen
2820 MODE 0
2830 TAGOFF
2840 PRINT CHR$(22)+CHR$(1)
2850 FOR a=1 TO 50:PLOT INT(RND*640),INT(RND*400),1:NE
XT a
2860 FOR a=1 TO 30
2870 x=INT(RND*19)+1:y=INT(RND*22)+1:GOSUB 500
2880 SOUND 129,INT(RND*640)+100,0,15,1,1
2890 NEXT a
2900 PEN 4
2910 INK 4,5,15
2920 PRINT CHR$(22)+CHR$(0)
2930 LOCATE 6,3
2940 PRINT "Englebert"
2950 INK 5,20:PEN 5
2960 LOCATE 4,15
2970 PRINT "By John Kennedy"
2980 SOUND 1,500,0,15,3,3
2990 FOR n=1 TO 2000:NEXT n
3000 FOR a=1 TO 5
3010 FOR b=26 TO 0 STEP -1
3020 INK a,ABS(b)
3030 SOUND 130,100+a*ABS(b),0,15,2,3
3040 FOR g=1 TO 3: CALL &BD19:NEXT
3050 NEXT:INK a,0:NEXT
3060 SOUND 4,0,0,15,7,0,15
3070 RETURN
3080 REM SCROLL CLEAR
3090 FOR a=0 TO 25
3100 CALL &BC4D
3110 SOUND 135,(a*10)+4,0,15,2,1
3120 NEXT
3130 RETURN
3140 REM instructions
3150 MODE 1
3160 PEN 1:INK 1,15
3170 INK 0,0:BORDER 0
3180 INK 2,11
3190 PAPER 2
3200 LOCATE 15,1
3210 PRINT SPC(11)
3220 LOCATE 15,2
3230 PRINT" ENGLEBERT "
3240 LOCATE 15,3
3250 PRINT SPC(11)
3260 PAPER 0
3270 PRINT:PRINT
3280 PRINT " The object of the game is to cover the py
ramid with footprints.                        You do this by
guiding Englebert using either the joystick or the key
s shown   below."
3290 PRINT " If you cover the pyramid,a harder blockpa
ttern will appear."
3300 PRINT " You will lose a life if you jump of the bl
ocks,or if you touch a squashy ball.  These squashy ba
lls delight in falling  on Englebert so be careful."
3310 PRINT:PRINT:PRINT
3320 PRINT "KEYS:-"
3330 PRINT "                    A  K
            ; /
                                    Z  M
    / \
3340 PRINT:PRINT "         Press a key to begin."
3350 WHILE INKEY$="":WEND
3360 MODE 0
3370 RETURN
```

Auto 64 by David Swinnerton makes use of multicoloured sprites and interrupt driven music on the CBM 64. The Basic also sets up the title screen which you will see as soon as the game loads. That is all the instruction you need to get the game going and you can use keyboard or joystick to play. Instructions are given in the game.

AUTO 64



```
10 REM*****************************
*******
20 REM**       AUTO RACING GAME
   **
30 REM**    FOR THE COMMODORE 64
   **
40 REM** WRITTEN FOR 'YOUR COMPU
TER' **
50 REM** BY DAVID SWINNERTON (C)
1985 **
60 REM*****************************
*******
70 REM
80 POKE52,130:POKE56,130:SO=5427
2:POKE650,255:HI$="000000":SC$="
":GOSUB480
90 PRINT"[CLR]     PLEASE WAIT FOR
INITIALISATION"
100 REM *******  SPRITE DATA  **
*****
110 FORT=12288TO12736:READD:POKE
T,D:NEXT
120 REM *******  SCREEN DATA  **
*****
```

(continued on page 75)

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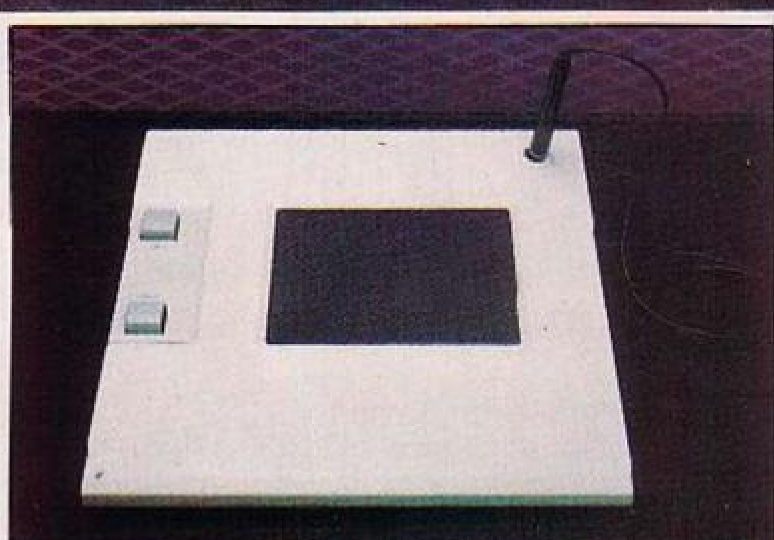

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(continued from page 73)

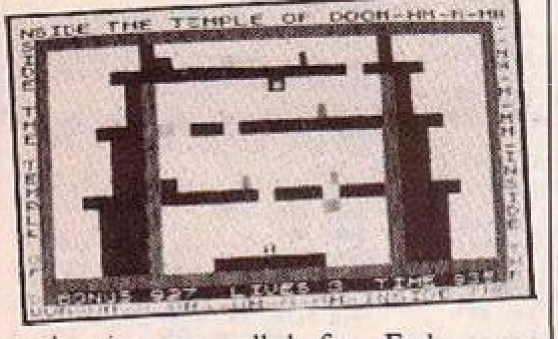
```
130 FORT=34048TO35347:POKET,.60:
NEXT
140 FORT=36864TO37863 POKET,5:NE
XT
150 FORT=1TO29:FORR=0TO4:POKE3
4048-(R*40)+T,32:NEXTR,T
160 FORT=36871TO37875STEP240:FOR
TT=0TO2:FORR=0TO25:POKET-(TT*40)
+R,2:NEXTR,TT,T
170 FORT=36991TO37875STEP240:FOR
TT=0TO2:FORR=0TO25:POKET+(TT*40)
+R,1:NEXTR,TT,T
180 FORT=0TO39:READD:POKET+35000
,D:NEXT
190 FORT=0TO39:POKET+37824,2:NEX
T
200 REM **** READ IN M/C DATA
****
210 FORT=49152TO50134:READD:POKE
T,D:NEXT
220 GOTO260
230 REM ******* GAME START ***
****
240 S=54272:FORT=STOS+24:POKET,0
:NEXTT
250 GOSUB480
260 PRINT"
            PRESS SPACE OR FIRE
     "
270 FORT=1TO50:IFPEEK(203)<>64TH
ENNEXT
280 PRINT"

     "
290 FORT=1TO50:IFPEEK(203)<>64TH
ENNEXT
300 IFPEEK(203)<>64THEN260
310 FORT=0TO5:POKE30208+T,0:NEXT

320 POKE53269,0:POKE53278,0:POKE
53279,0
330 TI$="":SC$=""
340 SYS 49152
350 POKES0+4,32:POKES0+5,5:POKES
0+6,255:POKES0+1,1:POKES0+4,129
360 FORT=0TO5:SC$=SC$+STR$(PEEK(
30208+T)):NEXT
370 T$=SC$:SC$="":FORI=2 TO 12 S
TEP 2:SC$=SC$+MID$(T$,T,1):NEXTT

380 IFSC$>HI$THENHI$=SC$
390 PRINT"
                  ";
400 PRINT"  YOU HAVE ACHIEVED A
SCORE OF "SC$"   ";
410 IF HI$=SC$THENPRINT"
YOU ARE NOW NO.1 AUTO ACE
";
420 PRINT"
              "
430 FORT=0TO10:FORR1=0TO5:POKE20
48,192:NEXTR1:FORR2=0TO5:POKE204
8,198:NEXTR2,T
440 POKES0+4,128
450 FORT=1TO6:POKET+35015,ASC(MI
D$(HI$,T,1))+128:NEXT
460 FORT=1TO1000:NEXT:POKE53269,
0:GOTO240
470 REM ******* TITLE SCREEN ***
****
480 POKE53281,0:POKE53280,0
490 PRINT"
500 PRINT"
510 PRINT"
520 PRINT"
530 PRINT"                 64
540 PRINT"
550 PRINT"
560 PRINT" ____________________
_____________"
570 PRINT"       WRITTEN FOR
YOUR COMPUTER"
580 PRINT"           BY DAVID SW
INNERTON"
590 PRINT"  USE THE JOYSTICK T
O CONTROL THE CAR"
600 PRINT"    OR KEYS:-      L
EFT"
610 PRINT"                  RIG
HT"
620 PRINT"                  SPE
EDUP"
630 PRINT"                  SLO
WDOWN"
640 PRINT"               HI-SCORE
:"HI$
650 RETURN
999 REM ******** SPRITE DATA ***
*****
1000 DATA 0,40 0,0,40,0,0,170
1010 DATA 0,60,154,60,32,166,188
,60
1020 DATA 154,60,0,166,0,0,154,0

1030 DATA 0,166,0,0,89,0,0,170
1040 DATA 0,0,130, 0, 2, 130, 12
8, 242
1050 DATA 150,143,242,150,143,25
0 130,175
1060 DATA 242,170,143,242,170,14
3,0,170
1070 DATA 0. 0, 170, 0, 0, 43, 0
, 234
1080 DATA 2,170,128,42 170,160,3
7, 169
1090 DATA 88,230,105,171,230,154
,91,230
1100 DATA 106,155,37,169,88,42,1
70,160
1110 DATA 42,0,168, 40, 0, 40, 4
2, 170
1120 DATA 168,34,170,136,34,170,
136,34
1130 DATA 170,136,34,170,136,226
,170,139
1140 DATA 232,0,43,234,0,171, 23
4, 170
1150 DATA 171,42,170,168,10,170,
160 234
1160 DATA 2,170,128,42,170,160,3
7, 106
1170 DATA 104,236,166, 107, 223,
 101, 91, 230
1180 DATA 106,107,37,106,164,42,
170,160
1190 DATA 42,0,168, 40, 0, 40, 4
2, 170
1200 DATA 168,34,170,136,34,170,
136,34
1210 DATA 170,133,34, 170, 136,
226, 170, 139
1220 DATA 232,0,43,234,0,171, 23
4, 170
1230 DATA 171,42,173,168,10,170,
163,224
1240 DATA 9,85,128, 6, 170, 64,
6, 170
1250 DATA 64,6,170,64, 10, 170,
128, 3
1260 DATA 207,0,3,207, 0, 42, 17
0, 160
1270 DATA 42,170,168,41,90,168,
31, 83
1280 DATA 168,33,166,168,38,169,
88, 38
1290 DATA 169,104,38,170,168,38,
169,104
1300 DATA 38,169,83,38,166,168,3
7,86
1310 DATA 169,41,90,168,42,170,1
63,224
1320 DATA  3, 0, 0, 0, 0, 0, 0
0
1330 DATA  0, 0, 0, 0, 0, 0, 0
0
1340 DATA  0, 0, 0, 0, 0  0, 0,
0
1350 DATA  0, 3, 240, 0, 3, 240,
 0, 3
1360 DATA 112, 0, 3, 240, 0, 3,
240, 0
1370 DATA  0, 0, 3, 0, 0, 0, 0,
0
1380 DATA  0, 0, 3, 0, 0, 0, 0.
3
1390 DATA  0, 0, 0, 0, 0, 0, 0,
234
1400 DATA  0, 0, 0, 0, 0, 0, 0
0
1410 DATA  0, 0, 0, 3, 0, 0, 0
0
1420 DATA  0, 0, 0, 0, 0, 0, 0
0
1430 DATA  0, 0, 0, 0, 0, 0, 0,
0
1440 DATA  0, 0, 0, 0, 3, 0, 0,
0
1450 DATA  0, 0, 0, 0, 0, 0, 0,
0
1460 DATA  0, 0, 0, 0, 0, 3, 0,
0
1465 DATA 0,0,0,0,0,0,0,0
1470 DATA 125,24,132,8,41,34,70,
16 100
1480 DATA 40,153,25,57,166,164,1
48,154,41
1490 DATA 0,165,16,,106,64,1,166
,
1500 DATA 0,105,0,0,170,72,1,150
,20
1510 DATA 90,190,129,209,149,150
,146,150 158
1520 DATA 182,126,165,234,170,10
2,146,170,155
1530 DATA 16,106,9,1,169,3,46,0
1540 DATA0,0
2000 REM ******** SCREEN DATA **
******
2010 DATA 160,160,160,160,160,13
6,137,186,176,175,176
2020 DATA 176,176,176,160,160 14
7,131,143,146,133,136
2030 DATA 176,176,176,176,176 17
6
2040 DATA 160,160,130,131,169,16
0,177
2050 DATA 105,164,181,160,160,16
0
2999 REM ***** MACHINE CODE DATA
 *****
3000 DATA  76, 239, 193, 160, 11
9, 133, 251, 169, 159, 133, 253,
 169, 211, 133
3010 DATA  252, 133, 254, 165, 3
, 141, 121, 120, 24, 165, 203, 2
01, 30, 176
3020 DATA  3, 76, 169, 192, 162,
 0, 160, 0, 173, 1, 220, 74, 141
, 0
3030 DATA  101, 175, 30, 24, 173
, 1, 208, 201, 50, 144, 30, 162,
 11, 169
3040 DATA  56, 195, 157, 0, 119,
 202  202, 224, 1, 208, 244, 206
, 1, 208
3050 DATA  206  1, 203, 169, 2,
141, 121, 120, 165, 9, 141, 4, 1
18, 24
3060 DATA  173, 0, 101, 74, 141,
 0, 101, 156, 38, 56, 173, 1, 20
8, 201
3070 DATA  200, 176, 30, 162, 11
 109, 72, 195, 157, 0, 119  202
 202, 224
3080 DATA  1, 208, 244, 238, 1,
208, 238, 1, 208, 169, 5, 141, 1
21, 120
3090 DATA  165, 1, 141, 4, 118,
24, 162, 0, 173, 0, 101, 74, 141
, 0
3100 DATA  101, 176, 4, 202, 202
, 202, 202, 24, 173, 0, 101, 74,
 141, 0
3110 DATA  101, 176, 4, 232, 232
, 232, 232, 24, 138, 109, 0, 208
, 141, 0
3120 DATA  200, 165, 203, 201, 1
2, 200, 12, 206, 0, 208, 206, 0,
 200, 206
3130 DATA  0, 203, 206, 0, 200,
201, 23, 208, 12, 238, 0, 208, 2
38, 0
3140 DATA  208, 238  0, 208, 238
, 0, 208, 201, 6, 200, 13, 174,
1, 206
3150 DATA  224, 50, 144, 6, 206,
 1, 208, 206  1, 203, 201, 3, 20
8, 13
3160 DATA  174, 1, 208  224, 200
, 176  6, 233, 1, 208, 238, 1, 2
08, 162
3170 DATA  15, 24, 189, 0  208,
125, 3, 119, 157, 0, 208, 202, 2
02, 224
3180 DATA  1, 238, 240, 238, 120
, 120, 173, 120, 120, 205, 121,
120, 176, 3
3190 DATA  76, 175, 193, 169, 0,
 141, 120, 120, 238, 5, 118, 173
, 5, 118
3200 DATA  201, 10, 200, 68, 165
, 0, 141, 5, 118, 238, 4, 113, 1
73, 4
3210 DATA  118, 201, 10, 208, 53
, 169, 0, 141, 4, 118, 238, 3, 1
18, 173
3220 DATA  3, 118, 201, 10, 208,
 38, 169, 0, 141, 3, 118, 238, 2
, 118
3230 DATA  173, 2, 118, 201, 10,
 208, 23, 169, 0, 141, 2, 118, 2
38, 1
3240 DATA  118, 173, 1, 118, 201
 10, 208, 0, 169, 0, 141, 1, 11
8, 238
3250 DATA  0, 118, 162, 5, 189,
3, 118, 105, 176, 157, 214, 7, 2
02, 16
3260 DATA  245, 160, 26, 177, 25
3, 153, 0, 10, 136, 16, 248, 16
0, 26, 177
3270 DATA  251, 145, 253, 136, 1
6, 249  56, 153, 251, 233, 40, 1
33, 251, 176
3280 DATA  2, 198, 252, 56, 165,
 253, 233, 40, 133, 253, 176, 2,
 198, 254
3290 DATA  24, 165, 252, 201, 21
6, 176, 210, 24, 165, 251, 201,
204, 176, 211
3300 DATA  160, 26, 185, 0, 101,
 153, 7, 216, 136, 16, 247, 24,
238, 56
3310 DATA  1.0, 173, 96, 119, 20
1, 15, 208, 46, 169, 32, 141, 4,
 212, 169
3320 DATA  0, 141, 96, 119, 238,
 144, 112, 238, 144, 112, 24, 17
4, 144  112
3330 DATA  224, 94, 144, 5, 169,
 254, 141, 144, 112, 183, 119, 1
95, 141, 0
3340 DATA  212, 109, 120, 195, 1
41, 1, 212, 169, 33, 141, 4, 212
, 36, 49
3350 DATA  224, 162, 251, 189, 2
55, 132, 157, 255, 3, 189, 249,
131, 157, 249
3360 DATA  4, 189, 243, 134, 157
, 243, 5, 189, 237, 135, 157, 23
7, 6, 189
3370 DATA  255, 143, 157, 255, 2
15, 189, 249, 144, 157, 249, 216
, 189, 243, 145
3380 DATA  157, 243, 217, 189, 2
37, 146, 157, 237, 218, 202, 208
, 205, 162, 7
3390 DATA  189, 106, 195, 157, 3
9, 208, 202, 16, 247, 162, 11, 1
69, 1, 157
3400 DATA  0, 119, 202, 16, 248,
 162, 5, 169, 192, 157, 248, 7,
202, 16
3410 DATA  248, 163, 0, 141, 144
, 116, 141, 126, 120, 141, 95, 1
13, 141, 30
3420 DATA  200  141, 31, 208, 16
9, 254, 141, 144, 112, 169, 255,
 141, 28, 208
3430 DATA  169, 7, 141, 37, 208,
 169, 0  141, 38, 208, 169, 12,
141, 33
3440 DATA  208, 169, 5, 141, 32,
 208, 159, 31, 141, 21, 208, 169
, 255, 141
3450 DATA  23, 208, 169, 3, 141,
 0, 117, 141, 1, 117, 162, 11, 1
89, 30
3460 DATA  195, 157, 0, 208, 202
, 16, 247, 165, 15, 141, 24, 212
, 169, 9
3470 DATA  141, 5, 212, 169, 0
141, 6, 212, 120, 169, 3, 141, 2
0, 3
3480 DATA  169, 192, 141, 21, 3,
 88, 162, 4, 142, 80, 119, 162,
9, 142
3490 DATA  81, 119, 189, 0, 208,
 201, 250, 144, 58, 24, 172, 18,
 208, 192
3500 DATA  17, 176, 240, 185, 40
, 195, 157, 0, 119, 174, 80, 119
, 24, 172
3510 DATA  16, 208, 192, 20, 176
, 248, 185, 88, 195, 221, 248, 7
, 240, 240
3520 DATA  157, 248, 7, 24, 172,
 10, 208, 192, 10, 176, 240, 185
, 100, 195
3530 DATA  157, 39, 208, 206, 80
, 119, 206, 81, 119, 206, 81, 11
9, 174, 81
3540 DATA  119, 224, 1, 208, 183
, 173, 30, 208, 201, 0, 240, 3,
76, 17
3550 DATA  195, 173, 31, 200, 20
1, 1, 208, 3, 76, 11, 199, 24, 7
6, 166
3560 DATA  194, 120, 169, 49, 14
1, 20, 3, 169, 234, 141, 21, 3,
88, 96
3570 DATA  170, 100, 150, 180, 1
90, 100, 110, 100, 236, 100, 1,
1, 1, 1
3580 DATA  2, 2, 2, 2, 3, 3, 3,
3, 1, 1, 3, 3, 2, 2
3590 DATA  2, 2, 4, 4, 5, 5, 2,
2, 3, 3, 4, 4, 5, 5
3600 DATA  1, 1, 1, 1, 2, 2, 1,
1, 2, 2, 2, 2, 1, 1
3610 DATA  1, 1, 197, 192, 193,
194, 195, 196, 197, 197, 197, 19
7, 197, 197
3620 DATA  197, 197, 197, 197, 1
97, 197, 197, 197, 2, 6, 9, 5, 4
, 7
3630 DATA  10, 14, 0, 1, 3, 24,
14, 210, 15, 195, 16, 209, 18, 2
10
3640 DATA  15, 195, 16, 209, 16,
 31, 21, 24, 14, 210  15, 195, 1
6, 209
3650 DATA  18, 210, 15, 195, 16,
 209, 18, 31, 21, 96, 22, 31, 21
, 239
3660 DATA  18, 96, 22, 31, 21, 2
09, 18, 195, 16, 31, 21, 209, 18
, 195
3670 DATA  16, 210, 15, 209, 18,
 195, 16, 209, 18, 31, 21, 195,
16, 96
3680 DATA  22, 31, 21, 209  18,
96, 22, 31, 21, 209, 18, 195, 16
, 21
3690 DATA  21, 209, 18, 195, 16,
 210, 15,209,18,195,16,78,13,24,
14 0,0
```

By COMBINING the program given here with the game Survivor published in the May edition of *Your Computer*, you can amend or completely rewrite any or all of the levels to your own personal requirements.

If you have not already done so, enter the game from last month's article retaining the machine-code loader. Although it is necessary to enter only the operating system if you intend to construct all your own levels, I strongly advise you to enter the data as well and overwrite it later. A prior knowledge of how the game performs is invaluable when writing new screens.

Use the original loader to enter the extra code from hex dump 2 giving 21320 as the start address. There is no need to add another Rem. Save to tape using a direct command without deleting the loader. Although it will be overwritten by the new Basic program, you will have to come back to this copy to use the checker if the new code does not work. Now delete listing 1 and enter the Basic graphics loader from listing 3. Save this by typing Run 15.

Before using it, however, some words of



explanation are called for. Each screen consists of a playing area 28 by 17 surrounded by a grey border with Bonus, Lives and Time displayed below. Around this the Title is scrolled. Data is needed for each level to store the title and playing area. As long as you stay within the constraints of the system, what is put into this playing area is limited only by your own imagination.

The display consists of black blocks on a white background; two grey lines of any length and direction; five aliens moving in any direction either reversing or one way only;

21320	3E17CD2E47000000	=	407
21328	0200002A0C401145	=	204
21336	00190E157E71E5F5	=	773
21344	0E03CD8842F1E177	=	1009
21352	E5F50E02CD8842F1	=	1138
21360	CDBB02444D51143E	=	702
21368	002804CD8D077EE1	=	796
21376	0135B8281C062EB8	=	547
21384	231C06368B281C06	-	366
21392	3FB8281C0634B828	=	597
21400	3606768B2841C35A	=	752
21408	5311010018001101	=	156
21416	0018161121001611	=	137
21424	112100197E0617B8	=	414
21432	C25A536FED52C35A	=	1162
21440	53BFED527E0617B8	=	932
21448	C25A5319C35A537E	=	866
21456	0680EB8260470C35A	=	759
21464	533E0077C35A5300	=	632
21472	3E0121784B11C300	=	508
21480	3D28031818FAE52A	=	674
21488	0C401111300191E1	=	232
21496	160406300E007EB8	=	464
21504	2002CB01237EB820	=	807
21512	02CBC9237EB82002	=	785
21520	CBD1237EB82002CB	=	994
21528	D9237EB82002CBE1	=	1024
21536	237EB82002CBE923	=	850
21544	7EB82002CBF1237E	-	919
21552	B82002CBF92379C1	=	1019
21560	0203C515C2FA5323	=	735
21568	1DC2F85301C90000	=	943

Hex dump 2.

five aliens which are stationary but flash on and off. Almost any character may be used for an alien — only four will not kill you. Bridges and elevators are made from a moving alien of CHR 128.

You must use all ten aliens and both grey lines in each level. Unwanted grey lines can be hidden in the border and excess aliens can be "lost" by making them white spaces in a white area. Aliens always unprint leaving a white trail. Remember this if you are moving them through black or grey blocks. Forty-three characters must be used for the title. Letters and graphics may be mixed, padded out with spaces to the correct length. You are allowed only one Exit although several Keys are possible by using CHR 151 for aliens.

I consider it absolutely essential to work out ideas on squared paper first. A pad of Quadrille from W H Smith's is invaluable here. Copy the grid from diagram 1 and plan your strategy carefully. Ensure that all intended jumps are possible. Remember you can only jump up four squares vertically or diagonally.

When you are satisfied that the drawing has been perfected it must be converted into data. This is done by the graphics loader in two parts. Firstly the black blocks for the screen are drawn directly and then compressed by the machine-code section. The second stage is concerned with the grey lines and aliens etc., and uses the Basic program. Everything must be worked out using grid references and character codes before any attempt is made to input a level.

Reload the program from tape. It should autorun and ask for a level number between one and 10. You may enter levels in any sequence. You are then given the option of drawing a new level or amending an existing one. If you answer "yes" to the prompt the drawing section will be bypassed allowing new data for aliens etc., to be entered.

Answering "no" will put the computer into "wait mode". If you proceed beyond this point, all existing screen data for the level chosen will be wiped out. You may abort at this point by using the Break key. Assuming you wish to proceed, pressing N/L will produce the Drawing Board.

The cursor is moved horizontally by keys I and P; vertically by keys Q and Z. Pressing O

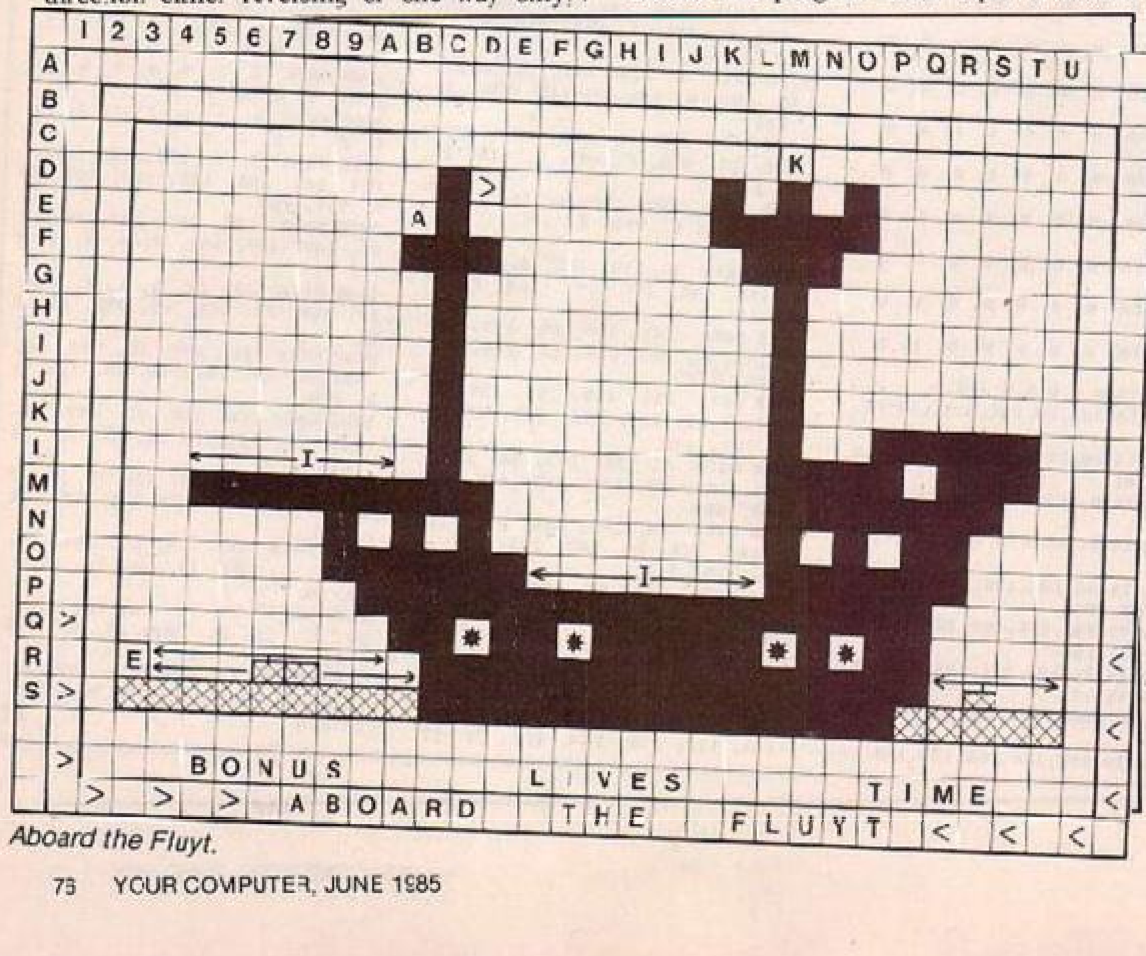
SUR

will deposit or erase a block. After completing the drawing, check it carefully as mistakes cannot be rectified without redrawing the whole picture. When you are satisifed that it is accurate press N/L and the screen will be converted into data. The program will now return to Basic and request information regarding the grey lines.

This second paret of the loader will accept grid references and graphic characters in the form of strings, or numbers as variables.

Using "Aboard the Fluyt" as shown in diagram 1 it can be seen that the grey lines run from S3 nine spaces to the right and from SQ five spaces to the right. Data for these is made up from the grid reference for the starting square followed by the number to be added or subtracted in order to reach the next square — for a vertical line 33, a diagonal line 32 or 34 and a horizontal line, as we have here, 1. Lastly we need the length of the line. So, data for the first line is S3 1 9 and for the second SQ 1 5. A grid reference must always be given vertical axis first. To input this, enter S3 and press N/L. Press N/L again to change to a numeral input. Enter 1 N/L, N/L a second time to recover the input and 9 N/L. Enter data for the second line in the same way.

You should now be asked for Key, Position and Exit locations. The key is a grid reference — CM. Enter and press N/L. Your starting position is EB. Enter and press N/L. The exit is R3. Once again enter and press N/L. Now comes the title. Enter this as a string of 43 characters and press N/L. If the length was correct it will be printed on screen. If this



Aboard the Fluyt.

does not happen, you will have to re-enter it correctly.

The next prompt is for the five moving aliens. Three grid references are needed to define each aliens position. The first is the starting square. For the Guard on the upper deck this is L7. The next two are the extremes of movement with — most important — the highest given first. That is, the position nearest to the bottom right of the screen must be entered before the position nearest to the top left.

This guard moves from L5 to LA so data will be L7 LA L5 pressing N/L between each. The next four characters are entered as a block and are arrived at as follows:

- Character of alien when moving from a high position to a lower position on screen.
- Character of alien when moving in the reverse direction.
- In the case of the guard, both are the letter I.

Next the direction in which the alien first moves; this is entered as a graphic and is either a space or CHR 1 dependent on whether it moves from a high to low position (CHR 1) or vice versa (CHR 0). Lastly the number of squares which need to be added or subtracted to reach the next position as it was with the grey lines, only this time entered as a graphic — CHR 1, 4, 5 or 6. — see your ZX-81 manual.

So we have the four characters. Enter 11 ▆ ▆ together and press N/L. Repeat for the other four moving aliens.

The five flashing aliens are defined by one grid reference followed by a block of three graphics each.

The first is the character initially, the second the character it turns into. For the Fluyt, all turn into white spaces although any of them could equally turn into black blocks or another character entirely. The last graphic is concerned with the time each character is flashed on and off, and could be one of four symbols. If you mentally divide the flashing cycle into four periods:

CHR 0 will print the first character for two periods

CHR 1 will print the second character for two periods

CHR 2 will print the first character for one period

CHR 3 will print the second character for one period

Darren Spridell with a diy game of survivor for the ZX-81.

VIVOR

To correct:	Byte no.
GREY LINES	68
KEY	76
POSITION	78
EXIT	80
TITLE	82
MOVING ALIENS	125
FLASHING ALIENS	175

Table 3.

When you have finished with the loader, save the game by typing Run.

Do not test a new level with endless lives. If you have created a loop, you will be stuck in it for ever. Make sure that the Break key is operational — see parameters table in part 1. If you want to limit the game to fewer than 10 levels, Poke 19198, followed by the number of levels required.

The best thing to do with errors is to avoid them and get your data accurate. Remember, this is being used by a machine-code program. If your data does not make sense to the computer, it will crash.

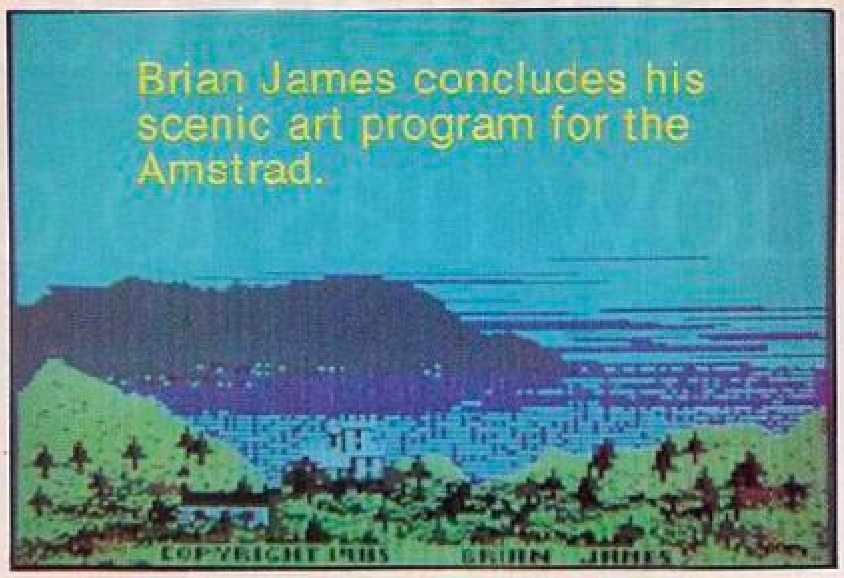
In spite of all your efforts, mistakes will probably occur. In any case you may wish to alter something to make the game harder or easier. This can be done. Run 18 will restart the loader to enable corrections to be made. If you make an error whilst inputting data, enter "Restart" in answer to any prompt. This will take you to the same correction routine as would answering "Yes" to the option for amending data given at the outset. You will then be asked for the byte number of the section to be corrected — see table 3.

High quality tape copies of the original Survivor containing a full 50 levels to test your powers — no one has yet reached the 51st screen — or the 10-level version with graphics loader for use in conjunction with this article are available from the author D Spridell, Cherry Tree Cottage, Common Road, Hopton, Diss, Norfolk IP22 2QU, price £3.50 each including postage. Please state which you require. ■

Listing 3. Basic graphics loader.

```
  15 SAVE "YC G.LOADER"
  18 CLS
  20 PRINT "**INPUT LEVEL**"
  30 INPUT L
  35 IF L>10 OR L<0 THEN GOTO 32
  40 PRINT "LEVEL= ";L
  50 LET P=PEEK 18005+256*PEEK 1
8006+((L-1)*202)
  60 PRINT "ARE YOU AMENDING DAT
A"
  62 INPUT Y$
  64 IF Y$(1)="Y" THEN GOTO 600
  66 LET A=68
  70 PAUSE 4E4
  80 CLS
  90 POKE 21473,L
 100 RAND USR 21320
 110 CLS
 120 DIM A$(5,17)
 130 LET A$(1)="2 GREY LINES"
 140 LET A$(2)="KEY/POSITION/EXI
T"
 150 LET A$(3)="TITLE"
 160 LET A$(4)="5 MOVING ALIENS"
 170 LET A$(5)="5 FLASHING ALIEN
S"
 180 DIM B(5)
 190 LET B(1)=68
 200 LET B(2)=76
 210 LET B(3)=82
 220 LET B(4)=125
 230 LET B(5)=175
 250 FOR F=1 TO 5
 252 IF A=B(F) THEN PRINT
 253 IF A=B(F) THEN PRINT A$(F)
 254 NEXT F
 255 IF A=200 THEN STOP
 260 INPUT C$
 264 IF C$="RESTART" THEN GOTO 6
00
 268 IF A=82 AND LEN C$<43 THEN
GOTO 260
 270 IF C$="" THEN GOTO 460
 280 IF LEN C$=2 THEN GOTO 350
 290 FOR F=1 TO LEN C$
 300 POKE P+A,CODE C$(F)
 310 LET A=A+1
 320 NEXT F
 330 PRINT C$;" ";
 340 GOTO 250
 350 IF C$<"B2" OR C$>"SU" THEN
GOTO 280
 355 LET D=(CODE C$(1)-CODE "A")
*33
 360 LET D=D+(CODE C$(2)-CODE "0
")
 370 LET C=INT (D/256)
 380 LET E=D-C*256
 390 POKE P+A,E
 400 POKE P+A+1,C
 410 LET A=A+2
 420 GOTO 330
 460 INPUT E
 470 POKE P+A,E
 480 LET A=A+1
 490 PRINT E;" ";
 500 GOTO 250
 600 PRINT
 610 PRINT "ENTER BYTE"
 620 INPUT A
 630 GOTO 110
```

Brian James concludes his scenic art program for the Amstrad.



LANDSCAPES

THIS MONTH we look further into the nature of probability which is the key concept in these programs for the Spectrum and Amstrad computers which generate landscape scenes spontaneously. Such a program first needs some basic knowledge about the subject to be portrayed. This knowledge is described by mathematical relationships. Some of these relationships are rigid ones — for example, solid features will hide the view behind them. Other relationships are not precisely defined; for example the slope of a mountainside may have almost any gradient, though very steep slopes occur only occasionally.

The program must be allowed freedom of choice wherever possible, but must not be allowed to do unusual things too often. That is — suitable probability functions must be used.

Listing 1 is a simple Basic program to demonstrate some probability distributions. The function RND returns a value between 0 and 1, with no bias. Therefore the combination

$$x = a + \text{RND} * b$$

gives a "flat" distribution — that is, equal probability of any value between the lower limit (a) and the upper limit (a+b). Now we can combine the RND functions in different ways to produce more subtle distributions. Suppose we put

$$x = a + (\text{RND} + \text{RND} + \text{RND} + \text{RND})/4 * b$$

This gives a hump-shaped distribution — a crude approximation to the famous "Normal" distribution. The values of x will tend to cluster around the middle with smaller probability of extreme values. Now consider

$$x = a * \text{RND} \uparrow 2$$

This will cause a skewed distribution, with small values of x having much greater probability than large values. A greater skew will be obtained from the function

$$x = a * \text{RND} \uparrow 4$$

and so on. It is important to realise that RND is different every time it is used — therefore

RND + RND is NOT equal to 2 * RND

Listing 2 is a very entertaining program using two-dimensional distributions to produce a multicoloured pulsating galaxy. The same distribution can be used for a cluster of leaves, daisies etc.

These programs are in Basic, which is very easy to enter and very easy to experiment with. The Landscape Creator itself has been written in pure machine code, because of the sheer number of calculations which have to be done. Each new landscape is created in about 8-20 seconds.

Suitable probability distributions can create surprisingly realistic mountain skylines. The slope must take values which are not too steep too often, not too straight, and not showing a regular pattern. There are big bumps and small bumps and even smaller bumps . . . The mathematical functions called fractals have this property of having an endless succession of smaller and smaller wiggles, in fact going on and on, to the infinitely small.

They have been used to create mountain scenery with remarkable realism by Lucasfilm, using very expensive high-resolution equipment. However, true fractals are purely mathematical abstractions . . . they have an infinite length, because of the infinite number of wiggles on an ever-decreasing scale of size, and therefore cannot actually be shown on any video screen! However my own functions are not unrelated to fractals, since they use two different magnitudes of wiggliness.

There is a problem with the random number generators in the home computer. They are not truly random; they are "pseudo-random". This means each number is not actually independent. You will eventually come back to the same sequence and go round in a big cycle. Also patterns can sometimes be found if you plot a random scatter of points.

What should we call this kind of art? I suggest the terms "artistic algorithms" or "computer creativity". The simplest kind of program, which draws diagonal lines at random polygons, could be said to be "random art". ■

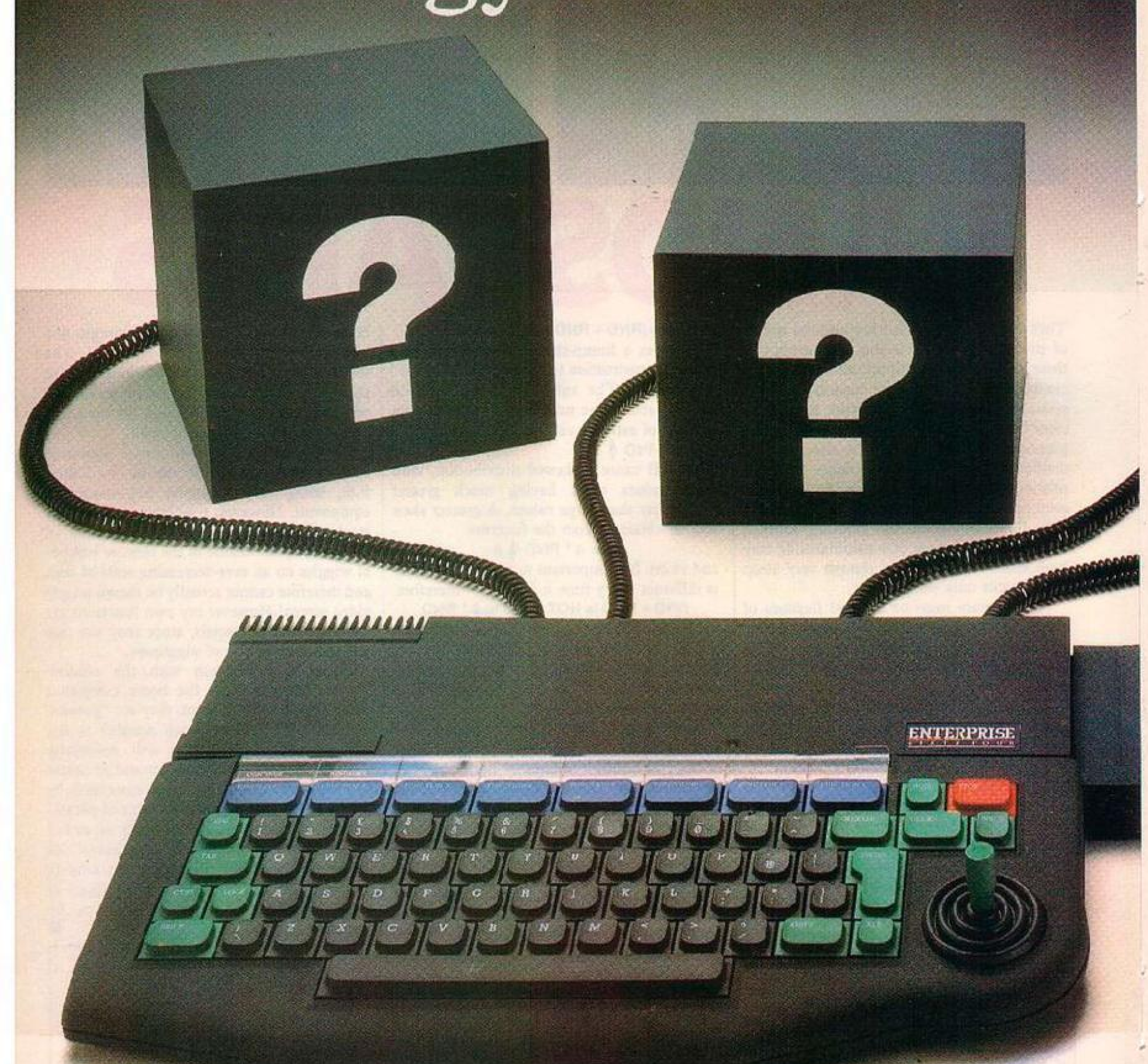
Listing 1.

```
3 ' SIMPLE DISTRIBUTIONS
4 '
5 'Brian James   April 1985
6 '
7 'AMSTRAD BASIC
8 '
9 CLS
10 KEY  7 ,"list "
11 n=300
12 LOCATE 1,4
13 PRINT"Flat distribution"
14 FOR i= 1 TO n
15 x=RND*640
16 PLOT x,300
17 DRAW x,310
18 NEXT
19 '
20 LOCATE 1,10
21 PRINT"Hump-shaped"
22 FOR i= 1 TO n
23 x=(RND+RND+RND+RND)*160
24 PLOT x,200
25 DRAW x,210
26 NEXT
27 '
28 LOCATE 1,16
29 PRINT"Skewed distribution"
30 FOR i= 1 TO n
31 x=RND↑8*640
32 PLOT x,100
33 DRAW x,110
34 NEXT
35 GOTO 9
```

Listing 2.

```
3 ' 'PULSATING PSYCHEDELIC GALAXY'
4 '    (BEST SEEN IN DARK ROOM)
5 '
6 ' DEMONSTRATES TWO-DIMENSIONAL
7 ' HUMP DISTRIBUTIONS
8 '
9 ' Brian James   April 1985
10 '
11 'AMSTRAD BASIC
12 MODE 1:INK 0,0
13 t$="Galaxy"
14 KEY 7,"LIST "
15 KEY 5,"WHILE 1:SAVE T$:WEND'
16 ON BREAK GOSUB 33
17 '
18 FOR i=1 TO 500
19 FOR c= 1 TO 3
20 x=c*30*(RND-RND) +320
21 y=c*30*(RND-RND) +200
22 PLOT x,y,c
23 NEXT
24 NEXT
25 '
26 FOR j=1 TO 3
27 FOR i=1 TO 50:NEXT
28 IF RND<0.6 THEN c=RND*25
29 INK j,c
30 NEXT
31 GOTO 26
32 '
33 INK 1,24:END
```

Instead of computers catc
technology now has to ca



The way we see it, technology has suddenly got quite a race on its hands.

There's no other home computer in the world that's so expandable or so updatable as the new Enterprise 64.

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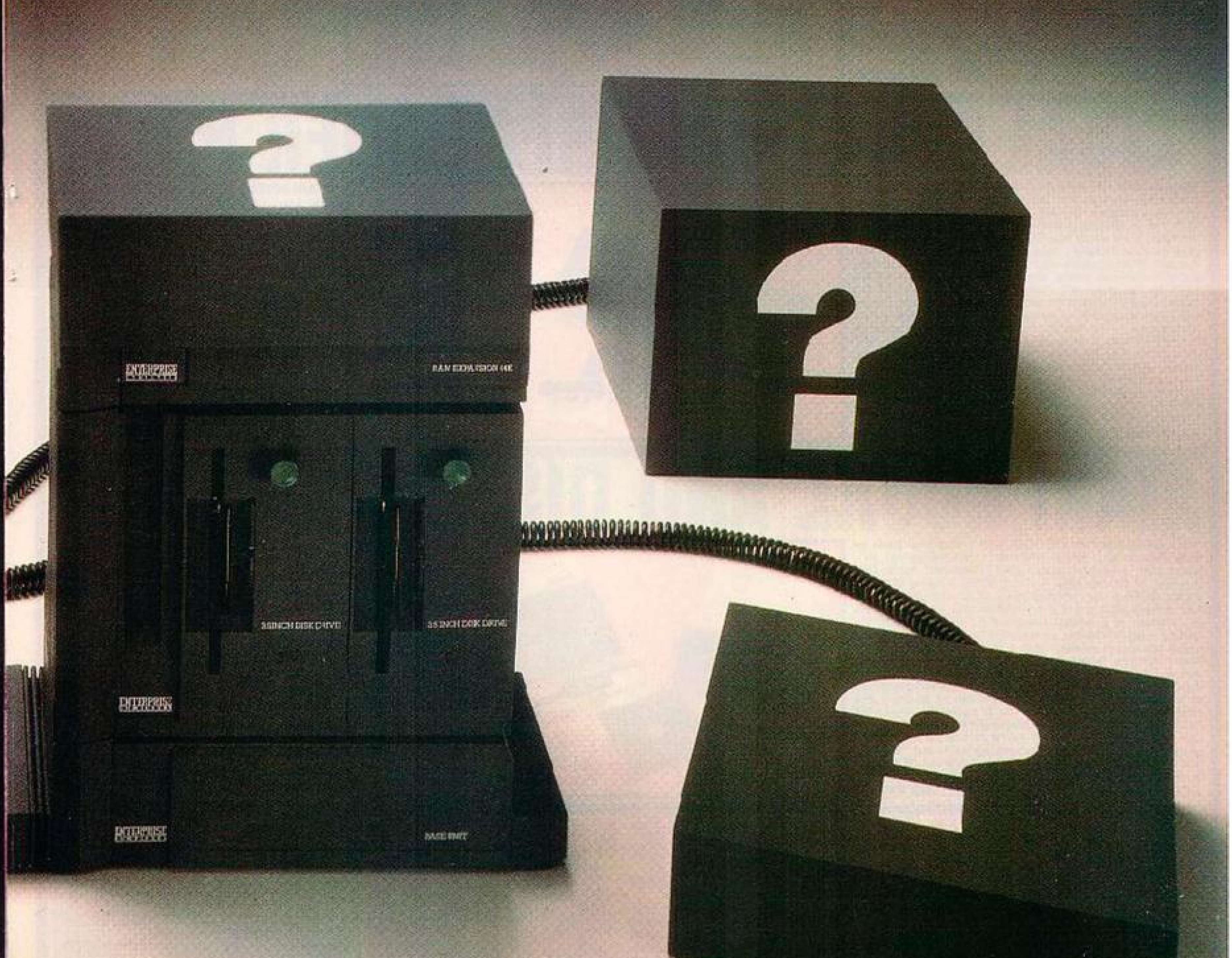
But plug in our special Rampacks to the base unit, and you can progressively increase that figure to a truly extraordinary 3,900K.

hing up with technology, tch up with a computer.



Not that that's the only challenge we present to today's ambitious programmers.

With a screen resolution of up to 672 x 512 pixels, 256 colours and a high speed video processor, the Enterprise will outgun all but the highest quality TV monitors.

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Combine the two and you can create effects that leave today's games looking like pub video tennis of the mid-seventies.

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The new Enterprise 64.

It hasn't just overtaken technology. It's left every other home computer straggling in the distance.

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£69

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1985 is the year of the mega-memory micros and here is your chance to win a 128K Atari 130XE with all the traditional Atari graphics capability yet with twice the memory of an 800 XL.

PLUS

Ten of the worst runners-up prizes we have ever given — copies of Firebird's Don't buy This compilation tape of the five worst ever programs sent in to them for evaluation.

RULES

- The winner of the competition will be the person who, in the view of the editor, comes up with the most amusing or clever idea for a computer cheat or scam.
- The name of the winner will be printed in the August issue of *Your Computer.*
- All entries must arrive at the *Your Computer* offices by the last working day in May 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
- Business Press International assumes no responsibility or liability for any complaints arising from this competition.

WITH 128K of memory to play with what sort of games would you like to see developed? Write down a short plot for a game and if you feel like it you could even draw a picture of the leading characters — if your wax crayons run to it even a potential screen shot.

Then we want you to think of the five worst computer games you have ever paid money for. If Firebird can produce a compilation tape of the worst they have ever had sent to them we're sure you can do better given the hundreds of other software houses which have produced rubbish only to sink without trace or who have survived one or two poor quality games yet have gone on to produce all-time classics.

Criticism in itself is not enough — we want you to name the guilty games that have sent you to sleep at the screen and show your own creativity with an idea to run on the Atari 130XE.

YOUR COMPUTER COMPETITION

Don't forget to enclose this coupon, or a photocopy of it, when you send your idea, which can be written or drawn or both, for a great new game plus your list of five bad programs, to *Your Computer*, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Name____________________

____

Address____________________

____

____

Name of your ideal game

____

Five worst ever programs

1____________________

2____________________

3____________________

4____________________

5____________________

This program is available on the Telsoft service.

Listing 1. The loader.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

Listing 2.

```
60000: C313ED2163EAE53A = 1104
60008: 3A5CFE0BCA17EBFE = 1129
60016: 0C2804FE142007FD = 622
60024: CB767EC25BEDED7B = 1329
60032: 3D5CE1FDCB017E20 = 993
60040: 0D2163EAE52A5D5C = 835
60048: 225F5CC35712FDCB = 1073
60056: 7676CCFCEBFDCB01 = 1384
60064: AEFDCE304EC4CD0E = 1171
60072: 210002FD7437FD71 = 826
60080: 26220E5C2C221650 = 357
60088: CDB01EFDCB37AECD = 1293
60096: 6E0DFDCB02EE3A3A = 935
60104: 5C3CFDCB766E2013 = 887
60112: 47FE0F3802C607CD = 803
60120: EF153E2077731191 = 851
60128: 131807FDCB76FE11 = 815
60136: BBF4CC0A3CAF1138 = 904
60144: 15CD0F0CED4B4558 = 721
60152: CD181F3E3AD7FD4E = 924
60160: 0D0600CD1B1ACD97 = 833
60168: 103A3F5CFD360OFF = 785
60176: 2163EFE513681324 = 955
60184: 5D5C2E7EFE21C27E = 361
60192: EA2211F4225D5C11 = 765
60200: 24F41AA71A7EEA47 - 1106
60208: 131A4FE71BEFE920 = 1014
60216: 0E10F5E7FD3600FF = 1068
60224: 131A5F131A67E913 = 555
60232: 10FD13132A11F422 - 644
60240: 5D5C13D6E17EFE7F = 1155
60248: 3306FDCB76EEC660 = 1200
60256: 323A5CC37EEACD54 = 1044
60264: EB0ACD54EB08CD54 = 1069
60272: EB13CD54EB7FCD54 = 1191
60280: EB30CD54EB81CD54 = 1305
60288: EB82CD54EB83CD54 = 1309
60296: EB84CD54EB8ECD0E = 1087
60304: EBFE2C20D5E7CD9E = 1372
60312: EBFE2C20DDE7CDF3 = 1457
60320: 24FDCB0176C018C2 = 1021
60328: CDA22C38E020E7C3 = 1069
60336: CDD52C385120FFC3 = 1104
60344: CDB0EEA72018F7CD = 1371
60352: B8EBFE2130A0C9CD = 1320
60360: D0EDFC0B2090CC9CD = 1268
60368: A22D3892D878F720 = 736
60376: 8D08C8ED4409CDCF = 1267
60384: EBC608FE1102E6E3 = 1259
60392: D508C3F37DE61FFE = 1308
60400: 1F280323F1C97DD5 = 890
60408: 1F6FF1C2F33E3FED = 1189
60416: 47ED56FB2921C0FA = 1129
60424: 1101FF3E7801C001 = 572
60432: EDB02109F122F9F5 = 1226
60440: 3EC332F8F8AF1223 = 1063
60448: F43EFFED47ED5EC9 = 1396
60456: D578A72009211F017 = 741
60464: ED52D1064FC9F5E5 = 1385
60472: 07280524F105D1C9 = 744
60480: F1FE3C2005112003 = 630
60488: 1918F2FE7028F611 = 950
60496: E006A7ED52C8E6DF = 1193
60504: FE0D2808FE3A2804 = 671
60512: CD54EE05FDCB017E = 1118
60520: C0FD362D2021E3EA = 903
60528: ED7E3C5CE321E718 = 974
60536: E5C37E18FE242804 = 903
60544: CD9EEBC2006C4E721 = 1073
60552: 0000221AF4FE3038 = 662
60560: 25FE3A2821380CCB = 693
60568: AFD607FE3A3817FE = 1041
60576: 403013FDCB017E28 = 754
60584: 0AD630211AF4ED6F = 923
60592: 23ED6FE710D7FDCB = 1301
60600: 017E2807ED4B1AF4 = 756
60608: CD2B2DDFC92118FB = 1025
60616: 1122003DC81918FB = 612
60624: 3D0F0F0F5F16F9D5 = 685
60632: DDE1C9A7C847D9DD = 1523
60640: 5E00DD23DD5600DD = 878
60648: 23E518000E00D979 = 640
60656: D9CB23CB12CB113D = 957
60664: 20F779AF77CDFAFA = 1368
60672: 7AAE77CDEBEB7BAE = 1387
60680: 77E1D905C8D9CD28 = 1223
60688: EC18CCF32100F911 = 1006
60696: 01F901FF003600FD = 797
60704: 30CD05EE3E20F5CD = 1166
60712: C5EC3E13BE300736 = 810
60720: 0023350018072368 = 345
60728: 30032813F2F13D20 - 694
60736: E5FBC353EDCD57EC = 1531
60744: 210008110100E5CD = 491
60752: 5503E1112000A7ED = 862
60760: 5220F0FD362600ED = 936
60768: 7B3D5C2163EAE3C3 = 1064
60776: 761BCD9EEBCD57EC = 1271
60784: CD88EBF34F0600CB = 1155
60792: 21CB10C321CD103A - 700
60800: 485C0F0F0F082100 = 250
60808: 0008D3FEEE1008EB = 970
60816: 532E0AB7ED522929 = 739
60824: 19207DCD20FD0D7C - 662
60832: 5120E8F318B5CD57 = 1187
60840: ECFDCB738E18ACCD = 1401
60848: 57ECFDC376FE18A3 = 1338
60856: CD96EBCD57ECCD50 = 1499
60864: EBFE0AD26EEB3215 = 1125
60872: F4CDB0E3FE0AD26E = 1444
60880: EB2A6D5C228F5CFE = 1033
60888: 06280557A7CD35E2 = 699
60896: 3A15F4FE03280557 = 717
60904: 37CD3522CDAD1C3A = 811
60912: 5D5C210058110158 = 460
60920: 015F0277EDB0C35B = 1012
60928: EDCD96EBCD57ECCD = 1560
60936: 50EBFE03D26EEB32 = 1278
60944: 15F4CDE3EBFE08D2 = 1353
60952: 5EEB5F3A15F45721 = 883
60960: 205801C3027EE607 = 646
60968: 5B20057EE6F8E277 = 1125
60976: 0B2378E120EFC35B = 900
60984: EDCD96E3CD57ECCD = 1560
60992: 50EBFE03D26EEB07 = 1235
61000: 07073215F4CDB0EB = 945
61008: FE08D26EEB070707 = 838
61016: 5F3A15F457210058 = 626
61024: 01C0027EE638EB20 = 826
61032: 057EE6C7B2770B23 = 903
61040: 78B120EFC35BFDCD = 1295
61048: 57ECE1FD660D24E5 = 1181
61056: 33ED4B455CC52163 = 853
61064: EAE5ED733D5C0114 = 989
61072: 20CD051FC3761BCD - 766
61080: 9EEBCD57ECD1D17A = 1461
61088: FE3E2004D5C376EB = 1113
61096: ED5318F13BF13218 = 960
61104: F4F533D5CDF12BCD = 1447
61112: E934300F2A16F422 = 690
61120: 425C3A13F432445C = 694
61128: C35BED332163EAE3 = 1167
61136: ED733D5C3761BDF = 1068
61144: CD7CECF2CC26AEB = 1398
61152: E7CD7CE2CD57ECCD = 1529
61160: A8EBC5CDA8EBC5E1 = 1630
61168: C171C370C35BEDCD - 1101
61176: 9EEBCD57ECCDBFEB = 1552
61184: 321DF4C3C5EC3600 = 1015
61192: 233600C35BEDCD96 = 967
61200: EBCD57EDCD58E5F5 = 1632
61208: CDC7EBCDD0ECF1F3 = 1772
61216: 3DDD7707DD7703FB = 1007
61224: C35BEDAF321CF4DF = 1243
61232: CD70EC3A1CF43CDA = 1173
61240: 7EEB321CF4DFFE2C = 1204
61248: 2003E713EBCD57EC = 1053
61256: 3A1DF4A7CA86EBCD = 1274
61264: C5EC3A1CF486FE11 = 1166
61272: C27EEB572221F423 = 1004
61280: 5E874F0600093A1C = 409
61288: F447C5D5E5CDA8EB = 1562
61296: E1D170287128E3E10 = 623
61304: CB38CB1938033D20 = 639
61312: F7EB38015FC110E2 = 1021
61320: 2A21F4F3722373FB = 1077
61328: C35BEDCD9EEBFDCB = 1577
61336: 017E280ACDC7EBCD = 1021
61344: D0ECDD2221F4AF32 = 1201
61352: 1CF4DFFE2C20123A = 901
61360: 1CF43CFE05CA7EEB = 1154
61368: 321CF4E7CD9EEB18 = 1175
61376: EACD57EC3A1CF421 = 1128
61384: 15F4A7CA5AEBF5E5 = 1450
61392: CDEFEBE17723F13D = 1312
61400: 20F4DD2A21F4DD5E = 1131
61408: 00CB98DDCB00863A = 974
61416: 1CF4FE012802CBDB = 991
61424: DD7705DD3606014F = 706
61432: 0500E113F409477B = 507
61440: 321EF47EDD7701DD = 1012
```

THIS ARTICLE describes a machine-code routine which adds a number of new commands to Spectrum Basic including several which permit the design and control of sprite graphics.

A previous article of mine on the subject of sprite graphics appeared in the January 1984 issue of *Your Computer*. This new routine has a number of new improvements over the earlier version. Because the sprites can now be controlled with Basic commands, instead of using Pokes, programming is simpler and the program itself is easier to read. Sprites can now be animated.

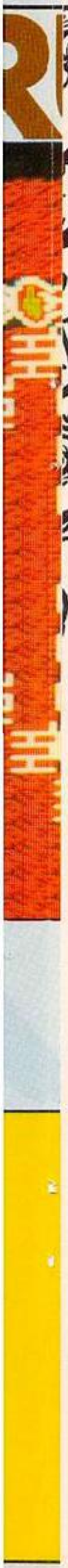
Up to four frames can now be defined for each sprite and the routine automatically switches from one frame to the next at a chosen speed. The method used for printing sprites has also been made faster, and sprites can move over other subjects on the screen without erasing them.

The routine can control up to eight sprites on the screen at a time. An interrupt routine which is called every 1/50 second while your program is running handles all the work needed to move the sprites, animate them, and detect collisions.

A hex dump of the routine is given in listing 2. The loader program — listing 1 — allows you to enter the machine code one line at a time. After each line you must input a checksum. If the checksum is incorrect the line must be retyped. When you have finished typing in the machine code, it should be saved to tape or microdrive before you run it.

The extended Basic is switched on with:

RAND USR 60000



SPECTRUM SPRITES

Robert Newman controls sprites in Basic.

This command must be given before you can use any of the new commands, and it should be the first line of any program which uses the extended Basic. The new commands are all preceded by an exclamation mark and can be typed in capital or lower case letters. Most of the commands must be followed by several numeric expressions — a number or a variable.

The !Doke and !Data commands will also accept hex numbers as a dollar sign followed by up to four hex digits — e.g., $FE59. If a command cannot be executed for any reason, the program stops with an error report as normal. Some of the commands have new error messages, for example an !Until which was not precedented by !Repeat gives the error "Mismatched Until".

!GRAPHIC character number: Character number must be in the range 1 to 32. This command tells the routine where to store the character pattern in the !Data command.

!DATA line1, line 2 . . .: This command can be followed by up to 16 numeric expressions, one for each line of the character being defined. Each numeric expressions can be a decimal number — maximum 65535 — a hex number, or a Bin number.

!CHAR sprite number, character 1 (, character 2 . .): This command shows what graphic character to use when printing the sprite. If you want the sprite to be animated, you can give a list of up to four character

(continued on next page)

```
61448  232B10F7DD2A21F4 = 881
61456  DD7E01CDC5EC7EDD = 1333
61464  771A23AF96DD771F = 875
61472  23DD751DDD741E3A = 827
61480  1EF4DD7700C35BED = 1137
61488  CD96EBCD57ECCDB0 = 1499
61496  EBFE03D266EB3215 = 1110
61504  F4CDC7EBCDD0EC3A = 1590
61512  15F4DD770BC35BED = 1139
61520  CD96EBCD57ECCDB0 = 1499
61528  EBFE02D266EBF5CD = 1488
61536  C7EBCDD0ECF1DD77 = 1664
61544  0CC35BEDAF321CF4 = 1032
61552  CD9EEBFDCB017E28 = 1221
61560  0BDD7FBCDD0FCDDD = 1520
61568  2221F4DFFE2CC26A = 1132
61576  EBE7CD96EBFE2C20 = 1336
61584  07321CF4E7CD8EEB = 1142
61592  DD57FDDD2A21F4DD = 1289
61600  CB0086DDCB00AE3A = 985
61608  1CF4A72816CDB8EB = 1125
61616  DD7709CDDEEBDC77 = 1351
61624  0ECDDEEBDD770DDD = 1250
61632  CB00E6CDB0EBFEB0 = 1479
61640  D266EBDC7718CDB0 = 1292
61648  EBDD77174FDD4615 = 952
61656  0EDD22DD7518DD74 = 1111
61664  1CED44E607DD7719 = 935
61672  DD7E05A7CA82EEDD = 1307
61680  CB00C6C35BEDCD57 = 1216
61688  ECCDFCEBC35BECCD = 1556
61696  57ECCD05ECC35EED = 1292
61704  F3DDE5D5F53A23F4 = 1488
61712  3CCDD0ECDDCB0046 = 1203
61720  20103A23F4CCEC07 = 662
61728  3223F4F1D1DDE1C3 = 1420
61736  3B00E5C508D9F5C5 = 1149
61744  D5E5DDCB005E223D = 1061
61752  DD7E06A72805DD35 = 841
61760  081832DD7E06DDBE = 846
61768  0520043E0118013C = 189
61776  DD7706DDE5E1233D = 1117
61784  20FC7ECDD5E07EDD = 1295
61792  771A23AF98DD771F = 878
61800  23DD751DDD741EDD = 950
61808  7E07DD7708DD7E09 = 837
61816  A72809FEFF2805DD = 955
61824  35091804DDCB00A6 = 660
61832  DDCB004E2007DDCB = 965
61840  00CEC3FDF2DDCB00 = 1240
61848  56CAAAF2DDCB0F86 = 1284
61856  DD7E08A7CA4AF2DD = 1264
61864  CB0D7E283BDD7E0D = 795
61872  ED4447DD7E0F9028 = 922
61880  03303CFFDDCB0FC6 = 916
61888  DDCB064E280CFEDD = 1031
61896  7E0DED44DD770DF1 = 1038
61904  1825DD3600DD0D36 = 624
61912  0E00DDCB00A64FDD = 904
61920  7E18C37FF2DD7E0F = 1076
61928  DD860D3805DDBE1F = 871
61936  3805DD7E1F18C5DD = 861
61944  77174FDDCB0E7E28 = 825
61952  3BDD7E0EED4447DD = 1017
61960  7E10903805DDBE1A = 764
61968  306ADD7E1ADDCE0A = 961
61976  C6DDCB084E280CF5 = 1006
61984  DD7E0EED44DD770E = 1020
61992  F11851DD360D0CDD = 855
62000  360E00DDCB00AEDD = 879
62008  77181843DD7E10DD = 818
62016  360EFEAF38363EAF = 924
62024  18CBDD7E0FDD8E0D = 957
62032  DD7717CC4DF3DDBE = 1298
62040  1FD440F31FDD7E10 = 1005
62048  DD860EDD5E1ADC4D = 1103
62056  F3FEB0380FCD4CF3 = 1269
62064  DDCB0E7E2004CE50 = 678
62072  1A02DA50DD771F47 = 755
62080  3EAF9047A71F371F = 736
62088  A71FA8E6F8A86779 = 1236
62096  070707A8E6C7AE07 = 793
62104  076F79E607DD751E = 841
62112  DD741CED44E607DD = 1128
62120  7719CD69F3DDCE0A = 1163
62128  BEDC7E1AA7287F4F = 976
62136  DD4618DD5E18DD66 = 996
62144  1CE5D9E10600DD7E = 1052
62152  19A708DD5E10DD56 = 851
62160  1EDDE5D5DDE1DD5E = 1454
62168  00DD23DD5600DD23 = 619
62176  08F508F128150E00 = 577
62184  C523CB12CB113D20 = 772
62192  F779A6B04779AE77 = 1195
62200  CDEBEB7AA6B0477A = 1332
62208  AE77CDEBEB78A6B0 = 1433
62216  477BAE77C5D9D1DD = 1123
62224  2308CD28ECE5D9E1 = 1200
62232  18BCDDE17AA72818 = 1009
62240  DDCB0AFEDDCB0C46 = 1194
62248  280CDD360D00DD36 = 615
62256  0E00DDCB00A60605 = 611
62264  DD7E17DD770FDD23 = 951
62272  10F6E1D1C1F1D9C9 = 1355
62280  C1E1C31AF1DDCE0A = 1114
62288  C6C9CD9EEBCD57EC = 1525
62296  CDB0EBFE09D23EEB = 1426
62304  A72806CD78F3C35E = 1067
62312  ED3E01FECD78F3F1 = 1354
62320  3CFE0920F8C35BED = 1124
62328  CDD0ECDDCB004EC8 = 1343
62336  DDCB004EDD360200 = 777
62344  C8DD4510DD5E12DD = 1078
62352  6614D9DD7E11A720 = 902
62360  053E1432EBEC4FDD = 908
62368  5E15DD5616DD7E12 = 809
62376  DDE5D5DDE1CDDEEC = 1769
62384  DDF1AF32FBECC9DD = 1518
62392  8EEBCD57ECCDB0EB = 1521
62400  FEB0D266EBF5CDB0 = 1603
62408  E5F5CDBFEBCDC5EC = 1719
62416  7EA7CA8AEB083EB6 = 1120
62424  32FBEC3201ED3207 = 652
62432  ED2323E5DDE1F1C1 = 1416
62440  C54FCDAA22C109ED = 1332
62448  44E60720053E1432 = 471
62456  EBEC4F08CDDBEC3E = [illegible]
62464  AE32FBEC3201ED32 = 1049
62472  07EDAF32EBECC35B = 1226
62480  ED90610000021801 = 505
62488  0200499A00030000 = 224
62496  00E0F903037A6170 = 810
62504  45ED056E6F697365 = 653
62512  8AED04645F6B65D7 = 931
62520  EE05726570656174 = 886
62528  77EE05756E74696C = 918
62536  97EE067363726565 = 925
62544  6EB3ED0673657469 = 974
62552  6E6801EE05736574 = 726
62560  706170657239EE07 = 838
62568  67726170686963F7 = 951
62576  EE06667261ED6573 = 852
62584  CEEF046461746128 = 710
62592  2F046368617293EF = 1040
62600  E36F6E6564E76530 = 630
62608  F0056F6E6C697450 = 671
62616  F00C707072697465 = 909
62624  6CFC026469F6F002 = 1040
62632  656EFFF005657261 = 1016
62640  736552F303707574 = 859
62648  B7FC000052656164 = 934
62656  F94D69736D617463 = 957
62664  68656420554E5449 = 657
62672  CC4E6E76616C6964 = 915
62680  206E6577206E756D = 725
62688  6265F2546F6F206D = 888
62696  616E792070617261 = 780
62704  6D65746572F32143 = 854
62712  46415220636F6D6D = 679
62720  616E642065787065 = 773
62728  637465E421475241 = 795
62736  5048494320636F5D = 643
62744  6D616E6420657374 = 781
62752  6563746564455E5E = 940
62760  656E695E6564206C = 750
62768  68617261637465F2 = 970
62776  0000000000 = 3
```

Listing 3.

```
   1 REM Listing 3 (demo)
   2 REM Sprites 1 to 7 are set
up to move at random around the
screen, while sprite 8 is moved
by using keys 5 and 8 to move
left/right.
   5 CLEAR 59999
  10 RANDOMIZE USR 60200
  20 BORDER 4: PAPER 5: INK 0: C
LS
```

(listing 3 continued on next page)

(continued from previous page)

numbers, and the routine will automatically switch from one frame to the next at a speed set by the !Frames command.

!FRAMES sprite number, delay: Delay can take values from 1 to 255, and controls the speed that the routine switches frames for an animated sprite.

!ON EDGE sprite number, edge action: This command controls what happens if a sprite reaches the edge of the screen. If edge action = 0, the sprite continues moving with wrap-around. A value of 1 causes the sprite to stop. A value of 2 makes it bounce.

!ON HIT sprite number, hit action: If hit action = 0, the sprite continues moving if it hits another object on the screen. A value of 1 makes it stop. !SPRITE sprite number, x, y: The sprite is printed on the screen, where x and y are the pixel co-ordinates of the top left-hand corner of the sprite's position.

!SPRITE sprite number, x, y, xmove, ymove, steps: The sprite is printed at position (x,y), and it then moves away for a specified number of steps — 1 to 254. It moves by xmove and ymove pixels at each step — possible values are from −8 to +8. If steps = 255, the sprite moves continuously.

!ERASE sprite number: The specified sprite is erased. !ERASE 0 will erase all active sprites.

!DI and !EI The interrupt routine which moves the sprites is switched on automatically by the Rand USR 60000 command, and normally continues running while the Basic program runs. It can be switched off by !DI and re-enabled by !EI.

To find out the position of a sprite at any time, or to examine its collision flag, the following user-defined functions can be used — where S = sprite number from 1 to 8:

```
DEF FN X(S) = PEEK (63727 + 32 * S) :
  REM X CO-ORDINATE
DEF FN Y(S) = PEEK (63728 + 32 * S) :
  REM Y CO-ORDINATE
DEF FN C(S) = PEEK (63722 + 32 * S) :
  REM COLLISION FLAG
```

The collision value is zero for no collision, 1 at the edge of the screen, and 128 when colliding with background or another sprite.

!PUT character number, x, y: The specified graphic character is printed on the screen at position (x,y).

!REPEAT: UNTIL condition: These two commands are found in Pascal and structured Basics. Any commands between the Repeat and the Until will be repeatedly executed until the finishing condition becomes true.

!DOKE address, value: This command does a double Poke of a 16-bit value to two consecutive addresses. Hex numbers can be used for the address and for the value to be poked.

!SET INK old colour, new colour: This command changes one ink colour on the screen to another colour. This can be used to make a picture appear instantly on the screen by first drawing it "invisibly" with its ink colour the same as the background paper colour and then changing the ink colour to make the picture appear.

!SET PAPER old colour, new colour: This command changes paper colours.

!SCREEN paper colour, ink colour: This command changes the colour of the screen without erasing its contents.

!BREAK OFF !BREAK ON: These commands disable or enable the break key.

!ZAP: This command makes a short zapping sound like a laser.

!NOISE length: This makes white noise for a time depending upon length, which can take values from 1 to 255.

You can test the routine by typing in the short demo program in listing 3. This program shows how to set up sprites and get them moving, either under computer control, or in response to the keyboard. Before you can type in any of the new commands, you must type Rand USR 60000.

This command switches on the extended Basic and lets the new commands be recognised and interpreted, and so it must also appear as the first line of any program.

Listing 4 is a graphic character editor program which you can use to design graphics instead of using the !Graphic and !Data commands. The 32 graphics characters are stored in memory between addresses 64280 and 65367. The editor program lets you design graphics on a large 16 by 16 grid and store them in the memory. The character set can be saved and loaded into another program to be used by the sprites routine.

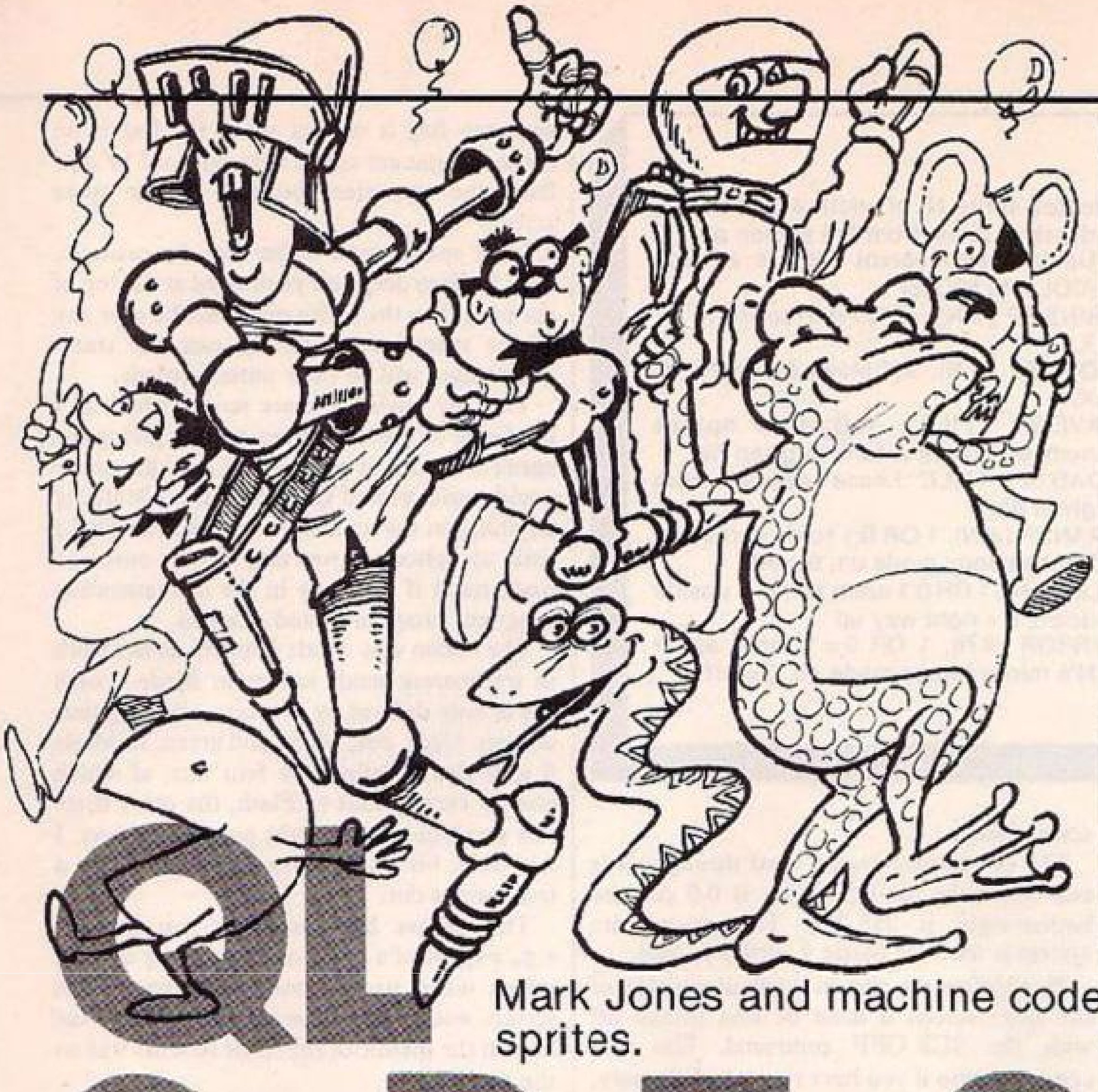
If you would like a copy of the programs on cassette, together with information on using the routine, please send £3 to R. Newman, 65 West St., Dundle, Peterborough PE8 4EJ. ■

(listing 3 continued from previous page)

```
  30 REM set up graphic chars
  40!graphic 1
  50!data $C02C,$2010: GO SUB 90
00
  60!graphic 2
  70!data $0CC0,$1020: GO SUB 90
00
  80!graphic 3
  90!data $3ff,$7ffe,$ffff,$C3C
3,$cfcf,$cfcf,$c3c3,$ffff,$ffff,
$ffff,$ffff,$db6d,$9249,$5249
 100 REM attributes for sprites
1 to 7
 110 FOR j=1 TO 7
 120!char j,1,2: !frames j,j
 130!on edge j,2
 140!on hit j,0
 150 NEXT j
 160 REM sprite 8 uses graphic 3
 170!char 8,3
 180 PRINT "To move sprite 8, us
e keys 5 or 8 to move left/right
"
 190 PRINT AT 21,0;"Press SPACE
to stop program"
 200 REM start sprites 1 to 7 mo
ving around at random
 210 FOR j=1 TO 7
 220!sprite j,RND*255,RND*175,RN
D*4,RND*4,255
 230 NEXT j
 240 REM start sprite 8 from mid
dle of screen
 250 LET x=120
 260!sprite 8,x,30
 270 REM read keyboard and move
sprite 8 if needed
 280!repeat
 290  !repeat:!until INKEY$<>""
 300  LET x=x+4*(INKEY$="8" AND
x<250)-4*(INKEY$="5" AND x>0)
 310  !sprite 8,x,30
 320!until INKEY$=" "
 330 STOP
9000!data $1320,$3ff0,$54a8,$f7b
c,$f7a8,$0A10
9010 RETURN
```

Listing 4.

```
   1 REM ** sprite editor ******
   2 REM © Robert Newman 1985
   3 REM
  10 RANDOMIZE USR 60000
  20 DEF FN y(n)=159-INT (n/5)*2
4
  30 DEF FN x(n)=(n-5*INT (n/5))
*24+136
  40 DEF FN l(n)=21-INT (FN y(n)
/8)
  50 DEF FN c(n)=INT (FN x(n)/8)
  60 DIM a(4)
  70 BORDER 4: !screen 5,1
  80 PRINT AT 5,4;"SPRITE CHARAC
TER EDITOR"
  90 PRINT AT 8,4;"Copyright R N
ewman 1985"
 100 PRINT AT 14,0;"Are you usin
g tape or microdriveto save/load
 characters?"
 110 POKE 23658,8
 120 INPUT "(T or M) ";z$
 130 IF z$<>"T" AND z$<>"M" THEN
 GO TO 120
 140 LET mdv=(z$="M")
 150 IF mdv THEN PRINT '"Put car
tridge into drive 1"
 160 GO SUB 9000
 170 LET a$="                "
 180 LET sc=64280
 190 PAUSE 100
 200 REM ***********************
*
 210 CLS : !screen 5,0
 220 FOR j=0 TO 15
 230 PRINT AT j,0; PAPER 7;a$
 240 NEXT j
 250 PLOT 0,47: DRAW 127,0
 260 FOR j=0 TO 21
 270 PRINT AT j,16;"
"
 280 NEXT j
 290 PRINT AT 3,17;"GRAPHICS ARE
A"
 300 FOR j=0 TO 31
 310 PRINT AT FN l(j)-1,FN c(j);
j+1
 320 NEXT j
 330 GO SUB 8000
 340 PRINT AT 19,24;"animated"
 350 PRINT PAPER 7;AT 22,27;"  ",
;AT 21,27;"  "
 900 REM **** main loop ********
1000 repeat
1010 GO SUB 9100
1020 PRINT "Possible options"
1030 PRINT "1 Draw     5 Clear"
1040 PRINT "2 Save     6 Load"
1050 PRINT "3 Fetch    7 Store"
1060 PRINT "4 Animate"
1070 PRINT "8 End program"
1080 repeat
1090  INPUT z$: LET z$=z$+" "
1100  LET opt=CODE z$(1)-48
1110 until opt>=1 AND opt<=8
1130 LET finished=(opt=8)
1140 IF NOT finished THEN GO SUB
 2500+500*opt
1150 until finished
1160 REM ** end main loop ******
1170 STOP
3000 REM ******* draw  *********
3005 GO SUB 9100
3010 PRINT "Move cursor with"
3015 PRINT "cursor keys."
3020 PRINT "I = ink pixel"
3025 PRINT "P = paper pixel"
3030 PRINT "E exit draw mode"
3040 LET x1=0: LET y1=0
3045 PAPER 7
3050 PRINT AT y1,x1; OVER 1;"+"
3055 OUT 254,252
3060 IF IN 64510=255 AND IN 6348
6=255 AND IN 61438=255 AND IN 57
342=255 THEN GO TO 3060
3065 IF IN 64510=251 THEN PRINT
AT y1,x1; OVER 1;"+": RETURN
3070 LET x2=x1: LET y2=y1
3075 LET a=IN 57342
3080 IF a=251 OR a=243 OR a=239
THEN PRINT AT y1,x1;"█";AT y1,x1
; OVER 1;"+": GO TO 3090
3085 IF a=254 THEN PRINT AT y1,x
1;" ";AT y1,x1; OVER 1;"+"
3090 IF IN 63486=239 THEN LET x2
=x1-(x1<>0)
3095 LET a=IN 61438
3100 IF a=251 THEN LET x2=x1+(x1
<15)
3105 IF a=247 THEN LET y2=y1-(y1
<>0)
3110 IF a=239 THEN LET y2=y1+(y1
<15)
3115 IF a=243 THEN LET x2=x1+(x1
<15): LET y2=y1-(y1<>0)
3120 IF a=235 THEN LET x2=x1+(x1
<15): LET y2=y1+(y1<15)
3125 IF x2<>x1 OR y2<>y1 THEN PR
INT AT y1,x1; OVER 1;"+";AT y2,x
2;"+"
3130 LET x1=x2: LET y1=y2
3140 GO TO 3060
3500 REM *** clear grid ********
3510 FOR j=0 TO 15: PRINT AT j,0
; PAPER 7; INK 0;a$
3520 NEXT j
3530 RETURN
4000 REM ***** save ************
4010 GO SUB 9100
4020 IF mdv THEN PRINT "Put cart
ridge in""drive 1"
4030 INPUT "Filename for save ";f$
4040 IF f$="" OR LEN f$>10 THEN
GO TO 4030
4050 PRINT "SAVE ";f$
4060 PRINT "CODE 64280,1088"
4070 IF mdv THEN SAVE *"m";1;f$
CODE 64280,1088: RETURN
4080 SAVE f$ CODE 64280,1088
4090 RETURN
4500 REM ******* load **********
4510 GO SUB 9100
4515!erase 1
4520 IF mdv THEN GO TO 4600
4530 PRINT "Press ENTER to""loa
d next file""or give filename"
4540 INPUT "Filename ";f$
4550 IF LEN f$>10 THEN GO TO 454
0
4560 LOAD f$ CODE 64280,1088
4570 GO TO 4700
4600 PRINT "Put cartridge in""d
rive 1."
4610 INPUT "Filename ";f$
4620 IF f$="" OR LEN f$>10 THEN
GO TO 4600
4630 LOAD *"m";1;f$ CODE 64280,1
088
4700 GO SUB 8000
4740 RETURN
5000 REM **** fetch graphic ****
5010 GO SUB 9100
5020 PRINT "Fetch which""graphi
c? ";
5030 INPUT "(1 to 32) ";no
5040 IF no<1 OR no>32 THEN GO TO
 5030
5050 PRINT no
5055 PAPER 7
5060 LET a=sc+24+(no-1)*34
5070 FOR j=0 TO 15
5080 LET b=PEEK a+256*PEEK (a+1)
: LET a=a+2
5090 PRINT AT j,0;
5100 LET n=32768
5110 FOR k=1 TO 16
5120 IF b<n THEN PRINT " ";: GO
TO 5150
5130 PRINT "█";
5140 LET b=b-n
5150 LET n=n/2
5160 NEXT k
5170 NEXT j
5180 PLOT 0,48: DRAW 127,0
5190 RETURN
5500 REM **** store grid *******
5510 GO SUB 9100
5520 PRINT "Store in which""gra
phic area? ";
5530!repeat
5540  INPUT "(1 to 32)";no
5550!until no>=1 AND no<=32
5555 FOR j=1 TO 4: IF a(j)=no TH
EN !erase 1
5556 NEXT j
5560 PRINT no: LET no=no-1
5570 PRINT FLASH 1;"PLEASE WAIT"
5580 LET hta=sc+no*34
5590 LET m=hta+2
5600 LET h=0: LET v=0: LET y=173
5610 FOR j=1 TO 16
5620 LET x=2: LET b=0: LET n=327
68
5630 FOR k=1 TO 16
5640 IF POINT (x,y)=0 THEN GO TO
 5660
5650 LET b=b+n: IF k>v THEN LET v=k
5660 LET n=n/2: LET x=x+8
5670 NEXT k
5680!doke m,b: LET m=m+2
5690 IF b AND j>h THEN LET h=j
5700 LET y=y-8
5710 NEXT j
5720 POKE hta,h: POKE hta+1,v
5730 PRINT PAPER 7;AT FN l(no),F
N c(no);"  ";AT FN l(no)+1,FN c(
no);"  "
5740!put no+1,FN x(no),FN y(no)
5750 RETURN
6000 REM **** animate **********
6010 GO SUB 9100
6020 PRINT "Give graphic no.""n
 press ENTER"
6030 FOR j=1 TO 4: LET a(j)=0: N
EXT j
6040 LET ano=0
6050!repeat
6060 PRINT "Frame ";ano+1;"? ";
6070 INPUT z$
6080 IF z$="" THEN GO TO 6110
6090 LET v=VAL z$: IF v<1 OR v>3
2 THEN GO TO 6070
6100 LET ano=ano+1: LET a(ano)=v
6110 PRINT z$
6120!until ano=4 OR z$=""
6130 IF ano<2 THEN PRINT "Animat
ion not""possible": PAUSE 200:
RETURN
6140 INPUT "FRAMES value ";v
6145!ERASE 1
6150 IF v<0 OR v>255 THEN GO TO
6140
6160!frames 1,v
6170 IF ano=2 THEN !char 1,a(1),
a(2)
6180 IF ano=3 THEN !char 1,a(1),
a(2),a(3)
6190 IF ano=4 THEN !char 1,a(1),
a(2),a(3),a(4)
6200!sprite 1,216,15
6210 RETURN
8000 REM *** display graphics **
8010 FOR j=0 TO 31
8020 PRINT AT FN l(j),FN c(j); PA
PER 7;"  ";AT FN l(j)+1,FN c(j);
"  "
8030 IF PEEK (sc+j*34) THEN !put
 j+1,FN x(j),FN y(j)
8040 NEXT j
8050 RETURN
8999 STOP
9000 POKE USR "a",255
9010 FOR j=1 TO 7: POKE USR "a"+
j,1: NEXT j
9020 POKE USR "b"+1,0
9030 FOR j=2 TO 6: POKE USR "b"+
j,16: NEXT j
9040 POKE USR "b"+4,124
9050 RETURN
9100 PAPER 5
9105 FOR j=16 TO 21
9110 PRINT AT j,0;"  "
9120 NEXT j
9130 PRINT AT 16,0;
9140 RETURN
9500 STOP
```



QL SPRITES

Mark Jones and machine code sprites.

AS THE STARVATION of QL games software continues you may be thinking it is about time you wrote some of your own. The following procedures are designed to allow you maximum flexibility at machine code speeds with operations for controlling a variable size spare screen and up to 65,535 sprites of variable dimensions.

To create the machine code, first of all copy program 1, line for line and save it to Microdrive cartridge. Now try running it. If you have an error, correct it, resave the Basic program and rerun the program with Run 20. It is important that line 10 is not executed again as this is the instruction which reserves procedure space, hence Run 20. Once the Basic program has run error-free you will be told to press any key to save the data. Put a cartridge in Microdrive 1 and the code will be automatically saved to this cartridge.

Machine-code procedures work in exactly the same way as Basic procedures except that memory must be reserved for them before any Basic procedures are present in memory. The normal practice is to set up these procedures in a boot program — see program 3 — and initialise them as soon as the computer is powered up.

You may then load up with a Basic program which contains Basic procedures. Do not define Basic procedures in the boot program. To check that your procedures are in place, once the computer has been booted with program 3, type SCR.FETCH. If the computer gives no error then your procedures are all ready to be used. At this point SCR.FETCH has no effect as no spare screen has been defined.

Until the screen procedures have been

(continued on next page)

Listing 2.

```
      100 REMark sprite demo program
110 MODE 4:OPEN #5,scr_512x256a0x0
120 CLS #5
130 PRINT #5 ,"Creating a sprite is as easy as drawing
 on the screen !"
140 PRINT #5,"e.g. >>>"
150 SCR_OFF
160 SCR_ON
170 SCR_STORE
180 INK #5,2:CIRCLE #5,60,70,10,.5,0:INK #5,4:LINE #5,
60,70 TO 65,75
190 CREATE_SP 7,64,90,43
200 a$=INKEY$(-1)
210 CLS #5
220 FOR f=0 TO 255 STEP 2:PRINT_SP f,f
230 CLS #5:CLS #0:PRINT #0,"That was a mode 4 sprite,
 mode 8 sprites are also possible..."
240 a$=INKEY$(-1)
250 MODE 8
260 INK #5,4
270 CSIZE #5, 2,0:PRINT #5,\" A SPRITE "
280 CREATE_SP 16,17,0,6,0
290 FOR f=0 TO 140:PRINT_SP f,f+6
300 PRINT #0,"BUT MODE 8 SPRITES CAN BE TRANSPARENT !
 WATCH THIS !"
310 PAUSE 50
320 FOR f=1 TO 15:INK #5,f:PRINT #5,"1234567890ABCDEFG
HIJ":TRANSP 1:SCR_STORE
330 FOR f=140 TO 0 STEP -1:PRINT_SP f,f+6
340 CLS #0:PRINT #0,"IMPRESSIVE ?":PAUSE 50
350 INK #5,5
360 PAPER #5,2
370 CLS #5
380 PRINT #5,\"SPRITES CAN ALSO BE USED TO WRITE MESSA
GES  LIKE THIS..."
390 SCR_STORE
400 CREATE_SP 1,12,0,0,2
410 TRANSP 1
420 BORDER #5,0:CLS #5
430 FOR g=9 TO 19 STEP 10
440 FOR f=0 TO 255
450 PRINT_SP f,g
460 IF NOT BEEPING: BEEP 4000,200,1000,4,0,3.3,3
470 NEXT f
480 NEXT g
490 PAPER #5,7:CLS #5:SCR_STORE
500 INK #5,2:PRINT #0,"SPRITES CAN ALSO BE FLIPPED UPS
IDE          DOWN OF MIRROR IMAGED":a$=INKEY$(-1)
510 PAPER #5,6:CLS #5
520 CLS #0:PRINT #0,"HERE IS A LITTLE BIT OF PROGRAM A
S A        BACKGROUND":LIST #5,100 TO 180
530 PAUSE 70:CREATE_SP 15,40,0,0,6:TRANSP 1
540 PRINT_SP:BEEP 1000,20:FLIP 1:PRINT_SP 50,50:PRINT
#0,"OOPS !":PAUSE 150:MIRROR 1:PRINT_SP 100,100:BEEP 1
000,20:PRINT #0,"AROUND"
550 PAUSE 150:FLIP 0:PRINT_SP 150,150:BEEP 1000,20:PRI
NT #0,"AND AROUND"
560 PAUSE 150:MIRROR 0:PRINT_SP 200,200:BEEP 1000,20
570 a$=INKEY$(-1)
580 PRINT #0,"FINALLY SCREENS CAN BE SWOPPED AND MOVED
 AROUND...":a$=INKEY$(-1)
590 PAPER #5,3:INK #5,7:CLS #5
600 FOR f=0 TO 20
610 FOR g=0 TO 30:PRINT #5,CHR$(48+f+g);
620 NEXT g:NEXT f
630 SCR_STORE
640 PAPER #5,6:CLS #5:INK #5,0:PRINT #5,"ANOTHER SCREE
N"
650 FOR f=0 TO 4:SCR_SWOP:PAUSE 100:
660 SCR_OFF:SCR_ON 0,50:SCR_STORE 0
670 FOR f=0 TO 200:SCR_FETCH f
680 PAPER #5,2:INK #5,7:BORDER #5,0:CLS #5:BORDER #5,1
:PRINT #5,"HAVE FUN SPRITEING!!!!";
690 CREATE_SP 34,12,0,0
700 FLIP 1:PRINT_SP:BEEP 1000,50:PAUSE 100
710 FLIP 0:MIRROR 1:PRINT SP:BEEP 1000,50:PAUSE 100
720 MIRROR 0:PRINT_SP:BEEP 1000,50:PAUSE 100
730 FOR f=0 TO 50:PRINT_SP f,f
740 FOR f=50 TO 0 STEP -1:PRINT_SP f,f
750 GO TO 700
```

Procedure definitions.

All parameters in brackets are optional.
SCR.ON (Y,DP):Turn spare screen area on default Y=0, depth=256
SCR.OFF:Turn spare screen area off
SCR.STORE (Y):Copy screen area from line Y depth DP to spare screen
SCR.FETCH (Y):Move spare screen down to line Y
SCR.SWOP (Y):Swop screen from line Y with spare screen area
Default value of y is that used for SCR.ON
**Depfth of area moved is always that specified in SCR.ON
All sprite procedures default to sprite 0 if no sprite number is included
CREATE.SP (#N),WD,DP,X,Y, (COL1),(COL2)..., (COL8)
Creates sprite N, of width 4*WD pixels, depth of lines, from the screen at X,Y. Up to 8 transparent colours allowed (COL1) to (COL8)
PRINT.SP (#N), (X,Y):Print sprite N AT X,Y
MOVE.SP (#N), X,Y:Move sprite N TO X,Y
SAVE.SP "FILE", A,B:saves sprites numbered from A to B to given file
LOAD.SP "FILE":Loads sprites from given file
TRANSP (#N), 1 OR 0:1 turns sprite N's transparency mode on, 0=off
FLIP (#N), 1 OR 0:1 turns sprite N upside down, 0=right way up
MIRROR (#N), 1 OR 0=1 turns sprite N's mirror image mode on, 0=off

(continued from previous page)

turned on with the SCR.ON command they have no effect. Typing SCR.ON 'y', 'n' will create a spare screen in the common heap which corresponds to an area n lines deep y lines down the screen. SCR.ON will default to a full-size screen if no parameters are specified. If there is not enough room for the spare screen an out of memory error will occur. Using SCR.STORE 'y' will copy that area of screen 'y' lines down the screen into the spare screen buffer.

If no parameter is specified here, as with all the other screen movement commands, the default value of y will be that first specified in SCR.ON. SCR.FETCH 'y' brings down the current spare screen to a point y lines down the screen. SCR.SWOP 'y' swops the area of screen y lines down the screen with the spare screen buffer.

The co-ordinate system used throughout is one where the top-left corner is 0,0 and the bottom-right is 255,255. This co-ordinate system is used for Mode 4 sprites as well.

To redefine the size and default position of the spare screen it must be first turned off with the SCR.OFF command. Use this command also if you have run out of memory, as it releases memory for other jobs. If you are very low in memory, Microdrive operations become very slow. Since one of the main uses of the spare screen is to allow Mode 8 sprites to be transparent I will explain this aspect in more detail.

When a Mode 8 sprite is first created you are given the choice of defining certain colours within the sprite as being transparent. This has no effect on the sprite when its transparency flag is off but when the flag is on those transparent colours are replaced by dots from the equivalent position in the spare screen.

If the spare screen buffer was, for example, only 50 lines deep and positioned at the top of the page then the sprite might not be over any of the spare screen, in this case the transparent dots will be their normal colour.

Thus by having a spare screen which is a duplicate of the real screen and by giving the sprite a border of transparent dots the sprite could move around the screen not disturbing anything on the screen. If this has all seemed a little complicated, you may find it easier to understand if you type in the demonstration program, program 2, and run this.

The reason why Mode 4 sprites do not work in transparent mode is that in Mode 4 each dot is only defined by two bits, allowing four colours: black, red, white, and green. In Mode 8 each dot is defined by four bits, of which one bit corresponds to Flash, the other three bits combine to give eight possible colours. I use this bit instead to correspond to a transparent dot.

This allows high-resolution transparency e.g., a sprite of a circle could be easily defined which when passing over anything on the screen would allow one to see through the hole in the middle of the circle to what was on the screen.

When a sprite is created it is saved on the QDOS common heap, if there is no room for it an Out of Memory message will be given. This means you do not have to allocate large areas of memory even though you are using say, three sprites. At the end of the sprite code, loaded into the RESPR area, there is a table with a pointer to each sprite.

If there is no sprite for a given number then the entry in the table is zero. This means that

Listing 1.

```
5 REMark SPRITE CODE CREATOR
10 ST=RESPR(2520)
20 RESTORE
30 X=ST
40 TOT=0
50 FOR G=0 TO 58
60 READ A$
70 FOR F=1 TO LEN(A$) STEP 2
80 B=CODE(A$(F))
90 C=CODE(A$(F+1))
100 TOT=TOT+B+C
110 IF B>57:B=B-7
120 B=16*(B-48)
130 IF C>57:C=C-7
140 BYT=B-C-48
150 POKE X,BYT
160 X=X+1
170 NEXT F
180 READ VAL
190 IF TOT<>VAL:PRINT "DATA ERROR AT LINE ";G*10+1000:
STOP
200 TOT=0
210 PRINT G
220 NEXT G
230 PRINT "CODE COMPILED  PRESS ANY KEY TO SAVE CODE."
:A$=INKEY$(-1)
240 SBYTES MDV1_SP_CODE,ST,2360
250 STOP
1000 DATA "347E011043FA00364E92700043FA0A322340000243F
A0A3A247C0002802026290000968 7E48B45FA",4326
1010 DATA "070E5543234300022CE51CBFFFC4E75000000000000
D02220653435 25F4F4E2001F6075343525F4F",4321
1020 DATA "464602C6075343525F4645544 34E02E2075343525F5
3544F524502F00E5343525F53574F502005DA",43:0
1030 DATA "035252494E545F5350200598074C4F56455F5350038
E0943524541544E5F53500E7006545 2414E53",4207
1040 DATA "50200352044 64C49502 0035C064C4952524F522000B
007534156455F53500010074C4F41445F5350",4249
1050 DATA "000000200000 9BCB67000576347801164E92367C000
16600056872FF7600D3CE2049700014E424A40",4300
1060 DATA "6600014043FA084676FF7406700034E434A40566 00012
643FA083445FA012C70F47E05121AB2196600",4343
1070 DATA "011251CFFFF676FF7404700343FA08164E434A40670
E007CFFF6660000F670000600000F043FA07FE",4404
1080 DATA "3C19321961000 7C6660000E06:0004344A40660000D
6224D76FF240170034E434A40660000C660B6",4266
1090 DATA "600000C0BBCB570004D82F0D2A4B504D2F0D347B011
64E92265F2A5FB67C0001660004BE34780112",4420
1100 DATA "4E92367C0002560004B03A3698003E3698022049584
8D1CE72FF760270014E424A80667E7800606E",4385
1110 DATA "42063C0547FA00763745 20006:00074667047000605
C220D6752080700126612 43FA005E74067007",4227
1120 DATA "4E434A2066440 8C70012740078001 42D00021B2D000
30002000067025242E34AC4C4504237420002",4197
1130 DATA "3C02224B7404700 74E434A0066142 24D340670074E4
34A00660870005245 8E45640E3E0070024E42",4291
1140 DATA "30071E75000020000535016 194C4515FA0000206A000
42608671220 6A0000070194E4145FA07EC7000",4246
1150 DATA "254000247000 4E752C3C2000800007E00BBCB672A347
801124E92B67C000266000 3D0428742 9A63E3A",430A
1160 DATA "98003C369802 3A07DA469A7C0101640003 74EF0FEF8
E45FA07A8262A000466BC220674007018 4E41",4440
1170 DATA "4A80661C45FA079225480000 91C72548000 4226A000
0D3C6254900008254 6000C4E757600BBCB6738",4331
1180 DATA "34780112 4E9270F1B67C0001662670FC42833636980
043FA0758 2C29000CEE8EDC43BC7C01016 40C",4431
1190 DATA "EFB870002 27C00002000 0D3C34A004E754:FA0736282
80004262800009684 60E2613066224 1FA0722",4305
1200 DATA "246800042 60A6700FF34246 800002228000CE489600
222DA31C9FFFC70004E756188 66FA244941FA",4397
1210 DATA "06F8226800042 60967 00FF0A226800006 0D46100FF6
E66DE41FA06DE2468000 4260A6700FEF02468",4406
1220 DATA "00002228000CE18960008241 22611 22C224C351C9FFF
670004E757C00BBCB67000 2380036000 78001",4342
1230 DATA "671A2F0D2A4B504D2F0D34780:124E92265F2A5F660
002563E3698003478011 24E9270004E7561CA",4396
```

you may have as many sprite pointers as you have memory between the end of the machine code and the top of physical Ram. The sprite system automatically detects this and will limit you to however many sprite pointers it can fit in. Thus to allow yourself more sprite pointers use a larger number in your RESPR command.

Since the machine code takes up 2,360 bytes plus another buffer on top of this, a calculation for 'x' number of sprite pointers is as follows:

respr (2360 + 300 + x * 4)

Obviously by giving yourself a lot of room e.g., RESPR (4000) you should never run out of sprite pointers, unless for instance you had a memory expansion board and were using the routine to create cartoons with hundreds of frames, feasible if you have half a megabyte extra!

To save and load sprites I have created two procedures SAVE.SP and LOAD.SP. Both procedures require a string parameter first e.g., "mdv1-sprite-data" which is the device to or from which you are moving the sprites. SAVE.SP also requires two more numbers which are the top and bottom number of the sprites you are saving. For example, to save sprite #20, sprite #21....to sprite #30, to the network you would type SAVE.SP 'neto-1' ,20,30.

Those sprites that had not been defined, between these two limits, would not be saved. Thus to save all the sprites in memory you might specify the range 1 to 1000 as only the sprites that actually existed would be saved.

Only on the SAVE.SP command are you allowed to use a sprite number that is out of range for the sprite pointers. This is because the save routine scans up the pointers saving all the sprites and automatically stops when it reaches the top of Ram. The LOAD.SP routine automatically loads sprites back to the Sprite numbers from which they were saved. N.B. if a sprite number being loaded is too large for the pointer table, the load routine will stop.

If you had two lots of sprite data you wished to combine both of which, for, example, held sprites 1 to 10, you would have to load up with one block of data and then print each sprite on screen and pick it up again from screen using CREATE.SP to move it to another sprite number.

For example, to move sprite #4 to sprite #24

PRINT.SP # 4,0,0 :
CREATE.SP # 24,4,16,0,0

You could then load up with the other set of sprites and save the combined set. It would be very easy to write a machine-code routine to duplicate sprites and I am sure the more adventurous of you could have a go at this.

To create a new sprite is very simple, it is in fact very similar to defining a window. CREATE.SP must be followed by the width of the sprite — number of pixels/4, the depth — number of rows, the screen x,y co-ordinates at which the graphics which will become the sprite are located.

If it is a Mode 8 sprite you may then follow this with up to eight colours which are the colours of the pixels on the sprite which will be transparent in transparent mode. These colours are the normal basic ink colours i.e. black=0, blue=1, red=2 etc.

The position of a sprite can be altered two ways, first using MOVE.SP x,y which will not print the sprite or using PRINT.SP x,y which will print the sprite. PRINT.SP does not actually require co-ordinates and defaults to the last position it was printed at or moved to.

The sprite flags are independent for each sprite and are preserved when the sprite is saved, as is the sprite position. Transp puts the sprite into transparent mode. Flip turns the sprite upside down and Mirror reflects the sprite about its centre. The sprite routine is slightly slower in transparent mode and much slower in mirror mode, flipping has no effect on speed.

NORMAL SPRITE = 29 prints per sec
TRANSPARENT SPRITE = 18 prints per sec
This figure will vary with the number of transparent dots and whether the sprite is completely over spare screen.
FLIPPED SPRITE = 29 prints per sec
MODE 8 MIRRORED SPRITE = 13 prints per sec
MODE 4 MIRRORED SPRITE = 11 prints per sec
TRANSPARENT MIRRORED SPRITE – 5 prints per sec

Obviously mirrored sprites are a luxury and if you require speed you should define a separate sprite as being the mirrored version of your sprite. A large amount of processing has to take place mirroring the normal sprite data when the mirror flag is on.

Combining the spare screen and sprite procedures can produce some interesting effects. ■

```
1240 DATA "4A0066000284367C00016600027C42863C076100053
06600022C200D6700026E3236700002010 0FC",4226
1250 DATA "6600025E323698000700004E7561CB660C08AD0000000
5832D000570004E7561B666FA08AD00010005",4285
1260 DATA "E309832D000570004E756100FFAF4A00AA0007?ABA7
C0004650002 1E3C0761000 4DC660001D03E03",4304
1270 DATA "3636980003836980023236980043436980648E77808DFF
C000000143C03287C00000000384308030000",4229
1280 DATA "6702524CE54EDC41BC7C00FF640001963C040C02650
0018E5947BE7C0009640001C845FA040834C7",4469
1290 DATA "60223C36900854497000BC7C0009640001B0E24EE21
0E24EE21014C07000E24EE21014C051CFFFDC",4429
1300 DATA "9FFC000000144 8E700082 86F0014200D670C204D701
94E41700029400000262F000C00030000 6702",4234
1310 DATA "52436340222F0010C2C35041740070 1D4C410FFC000
0001E4A806600FDD49FFC0000001E4CDF1000",4385
1320 DATA "4CDF041E2548000010C110C210C310C420FC0000000
02946247C00020000605A48E7780460467A04",4279
1330 DATA "48A71000602A48A760006100 03C2163290001832900
1E32BE32CE308E316E30EE316E30CE317E30C",4389
1340 DATA "E3174C9F00065241 51CDFFD461521B4600001887C00
0524D4C9F000651CBFFBE4CDF201E5242D9CC",4536
1350 DATA "D6CC51CDFFA470004E7548E700802E01200D6700000
E7019204D4E41700029400000220774FF701E",4373
1360 DATA "4E41294800002A4822074CDF01004E7548A73C0047F
A038636 1B603E343C0004380634076 02E103C",4350
1370 DATA "0000E20DE210E20DE2108028000066161 03C0000E20
CE20CE2100225000166000 0C6000600 2C40C",4306
1380 DATA "E41EE41F51CAFFD0544851CBFFC04C9F003C4E7570F
C4E756100FDB46600FDF61B7693010 00047000",4590
1390 DATA "4E756100FC6E4A00A676A67C0002662 03C07610002E
066D4200D671E32369300343 69302 1B410000",4289
1400 DATA "1E420001700004E7570F14E7570F94E7542876100FD3
63C074A00651 04A43670CB67C000266E261C2",4369
1410 DATA "66E46005610002 9E66922 00D67D648E700022C7C000
000045FA030E266A000424 7C00020000 4201",4275
1420 DATA "4282121D141D1A017C00020500036702524 63E02610
00250428242 83141D161D2C42030200006702",4172
1430 DATA "524E2840584D1002E2086404D03C000115946 0003154
0000242853A013E3CFF00E26C32073C044644",4294
1440 DATA "3E04303C00FF90418043640236003 03C0080082C000
000016 70C4442428234035342EF8AD2C2082C",4284
1450 DATA "00010001670C082C0000FFFE6704DA7C000E6000019
248E790407000107C00002A1FA021248E70004",4273
1460 DATA "082C00010001673A3200E34965049AFC0002DAC1082
C0000FFFE67049AFC0002262D00002835E000",4358
1470 DATA "E8AFFRAC4A434A446100015031440008230C3554D51C
8FFE260182 62DFFFE2835E0FEEAA8EAAC3144",4603
1480 DATA "008230C3544D51C8FFEA7000102CFFFE4CDF2000DAC
EDACE3200D02C000341FA019C163290001832",4517
1490 DATA "9001C606C806CF280000CF28000828728000089280 08
248E70040D2C1D2C1D0C11632900018329001",4301
1500 DATA "C607C807CD280000CD28000828728000089280 0824CD
F0200163900028034 6/000076 4A2C000006618",4270
1510 DATA "41FA014 22263CAAAAAAAA122CFFFEE409C79851C9FFF
C6076260B67E42409D48841FA022626 280000",4584
1520 DATA "28200000D4046 4D0D40363CC48E7804041FA010A122
CFFFEE409262800000283555555554A836732",4394
1530 DATA "2003E3080008374 03E188E1881633980010339801544
951CAFFF0C684C0A446A4C9A80000C9A80002",4421
1540 DATA "87A00000B1A0008260025049584851C9FFBA4CDF020
141FA00841 83C007F601415A800009000 15A8",4364
1550 DATA "0082900154495248 3609C60457C8FFEA4CDF0209D2C
051C8FE6E70004CDF40004E754840103900 02",4443
1560 DATA "8034671CE458E45C303C0007E588E858E58CE85C51C
8FFF64843484448404E75E258E25C303C000F",4564
1570 DATA "E388E458E38CE45C51C8FFF660E23601E20802 01000
3E309EF4A224202430 1FED2C34E7502360000",4486
1580 DATA "FFFF49FA001C202C00000800665 00FCE649FA012EE58
ED9C62A6C000070004C750000 2000000000000",4407
```

Listing 3.

```
10 ST=RESPR(4000)
20 LBYTES MDV1_SP_CODE,ST
30 CALL ST
40 PRINT "PROCEDURES INITALISED"
```

PROCEDU

My program gives the Spectrum all the advantages of procedures and local variables — a BBC Basic nicety. To make the five new commands offered by the program easy to use you simply put them in inconspicuous Rem statements, without having to bother with the hassle of machine code calls. As you would expect, the program is written in machine code; about 1.5K of it. Listing 1 shows the machine code. The program Pokes the machine code into a graphics area. The machine code is stored in 26 Data lines, each one — save the last — holding 64 bytes of code. Each code block has its own checksum to ensure its integrity.

Once you've got an error free version in memory, you can save the code using:

SAVE "PROC CODE" CODE 63765, 1603

You can reload at any time using:

CLEAR 63764: LOAD ""CODE

As I said earlier, the new commands are put in Basic Rem statements, with a limit of one command per Rem. For a program to use the new commands its first line must be Randomize USR 63765

Procedure commands

For the moment I'll concentrate on the commands directly connected with procedures: Defproc, Proc and Endproc. A procedure is a block of Basic code preceeded by a Defproc and terminated with an Endproc. To save the impersonal approach of calling blocks of code using line numbers, procedures use the more flexible and friendlier system of calling blocks of code by a name. Usually the name of a procedure would be short and give some indication of the procedure's function.

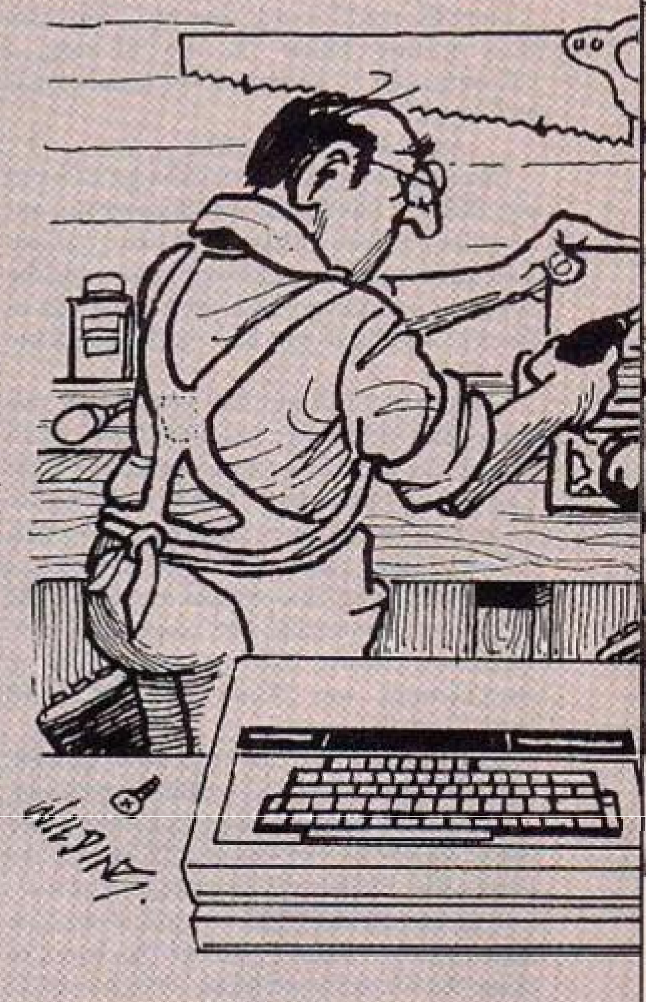
You can put spaces in but the computer ignores them. You can also put the names in either upper or lower case, or even a mixture of the two, but it doesn't make any difference. The same is true of the commands themselves, although it's wise to put them in upper case to make the program more readable. Sometimes it's a good idea to highlight the start and end of procedures in inverse video or in different colours to make it less difficult to locate when debugging. The general format of a procedure would be as follows:

```
8000 REM DEFPROC thing
8010 . . . . . . . . .
8020 . . . . . . . . . BASIC code
8030 . . . . . . . . .
. . . . . . . . . . .
8200 REM ENDPROC
```

That's all very well but you need some way of actually calling the procedures, so along comes Proc, the "hi-tech" equivalent of Gosub just as Endproc is the equivalent of Return. Again, the Proc can be put in a Rem statement anywhere in the program. It is followed by the name of the procedure you want to call, so "Proc thing" calls the procedure at line 8000. The space in between Proc and the name is optional. You might wonder how the program knows that there is a procedure called "thing" if the computer has never previously executed line 8000. When the Rand USR is used the machine code looks through every line in the program.

If any line has a Defproc in it then it looks up the procedure's name and what line it's on and stores that information in a special area of memory. In fact, this special area of memory is at the start of the variables area. The machine code sets up a string variable called @$ and puts any data about procedures and other info in that string. Since you can't change a @$ variable from Basic you can't corrupt it — unless you use some vicious Pokes! However, you can use Clear and scrub out all the variables. The program won't do anything drastic like crash but just gives an error report. As with Gosubs you can nest procedures, but with a limited depth of 255 levels.

There is one more twist to the story of procedures, the concept of parameters. When you write a normal Basic subroutine it usually has to rely on variables defined somewhere else in the program to perform its function. Although passing numbers to a subroutine in this way is quite workable its certainly not the most elegant of methods.



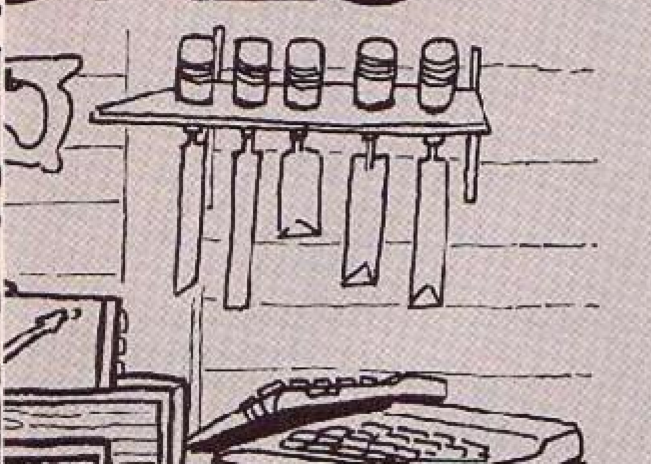
Fortunately, there is a neat way of passing values to a procedure that works in a similar sort of fashion to the Def FN and FN commands of normal Sinclair Basic. Say you want a procedure called 'print' that puts an X at a certain line and column on the screen. You would write it like this:

```
8000 REM DEFPROCprint(x,y)
8010 PRINT AT y,x;"X"
8020 REM ENDPROC
```

The contents of the brackets at the end of the Defproc statement define what variables

Listing 1.

```
  10 REM         'PROCEDURES'
  20 REM    1984 Richard M Taylor
  30 REM
  40 REM         48K Version
  50 REM
  60 CLEAR 63764
  70 LET a=63765
  80 FOR l=1 TO 25
  90 LET t=0: READ v,a$
 100 IF LEN a$/2<>INT (LEN a$/2)
 THEN GO TO 200
 110 FOR c=1 TO LEN a$ STEP 2
 120 LET x=CODE a$(c)-48-7*(a$(c
)>="A")
 130 LET y=CODE a$(c+1)-48-7*(a$
(c+1)>="A")
 140 POKE a,16*x+y
 150 LET t=t+16*x+y
 160 LET a=a+1
 170 NEXT c
 180 IF v<>t THEN GO TO 200
 190 NEXT l: PRINT "Data OK - No
w save machine code to tape.": S
TOP
 200 PRINT "ERROR in line ";990+
l*10
 210 STOP
1000 DATA 5163,"2A4B5C010800CD55
16233640233605233600233601233600
2335002336002336002A535C2B1EEACD
8B1D3819C5E7FE2A28091153F9CD2DFE
D468FAE118E76465"
1010 DATA 8714,"6670726FE3ED7B3D
5C183EE7CDBF16FD340DDF0600FE0D28
30FE3A28EE2185F9E54FE779FEEA285A
FEFACA36FBC3441BCD541F3802CF14FD
CB0A7ECA6BFBDFFE"
1020 DATA 6404,"0D2806FE3A28C4CF
0B2A555C3EC0A62802CFFFAFFE01CE00
56235EED53455C235E2356EB19232255
5CEB225D5C571E00FD360AFF15FD720D
289114CD8B1928BE"
1030 DATA 7789,"CF16DFFE2AC4E0F9
E1183EFE0DC806051140FACD2DFE304D
131310F73E01ED7B3D5CC61A323A5CE1
```



are used by the procedure. The associated Proc might look something like this:

```
20 Proc print(10, 12)
```

When the print procedure is called, the number 10 is placed in x, and 12 in y. The x and y at line 8000 are called the formal parameters, the variables that will hold the values given by the Proc. A procedure can have as many formal parameters as you like, including none at all — in which case there's no need for the brackets. The variables themselves can be of any type normally found in Sinclair Basic, except for array variables of any sort but its unlikely that you would want to use these for passing values anyway. Therefore a, ab, a$ and a long named variable are all valid but a(1,z) and A$(3) are not.

Richard Taylor with a program to allow your Spectrum to simulate the BBC's Proc commands.

In the Proc statement you can either use numbers, strings — enclosed in the usual quotes — or variables — don't mix these up with the formal variables — but there must be the same amount of them as in the corresponding Defproc and they must be of the right types. If the first Defproc formal variable is a string then the first Proc expressions must also be a string. You're not allowed to do any mathematics in a Proc statement, so −1, 0.1 and "a" are valid but 1*2, SIN(0.1) and STR$(1) are not. The following procedure draws a rectangle of a specified size and position.

```
8000 REM DEFPROCrectangle (x,y,a,b)
8010 PLOT x,y
8020 DRAW a,0: DRAW 0,b
8030 DRAW −a,0; DRAW 0, −b
8040 REM ENDPROC
```

Four numeric parameters

The procedure has four numeric parameters. The first two give the position of the rectangle's bottom left corner, the penultimate one gives the width and the last one the height. Procrectangle (88, 68, 80, 40) draws a rectangle of height 40 and length 80 slap bang in the middle of the screen.

The last two commands offered by the program, Local and Recall are concerned with local variables. The concept of local variables can be difficult and confusing for one to grasp but, basically, it allows you to have two variables with the same name but with different values in the computer simultaneously.

A lot of programming errors are caused by using the same variable twice for conflicting purposes. These sort of bugs are often particularly difficult to track down. Such a problem shouldn't really occur because there are 26 string variables to choose from, 26 loop control variables and an infinite number of numeric variables. However, some variables tend to get used a lot more than others. For instance a,b,c,d for numerics, a$,b$,c$ for strings and i and n for loop controls.

Programmers seem to have an unexplainable aversion to using k,w, and the like. What the Local command does is make a second copy of certain variables and store them in its safe cubby hole at the start of the variables area. Then with another command the second copy can be miraculously recalled. The point of the whole exercise is that if you use a new variable in a procedure then you can localise it before you actually get down to using it so that when you unlocalise when you're finished you can be sure that its got its original value back again. Another part of the program won't even know that you've been secretly tampering with some of its variables. The Local command is followed by one or more variable names separated by commas.

These are the names of the variables that you want localised. The command that does all the unlocalising business in a procedure is our previously introduced friend, Endproc. As well as returning control to theline after calling Proc, Endproc also unlocalised all variables that were localised in that particular procedure. For instance

```
8000 REM DEFPROC useless
8010 REM LOCAL a,a$
8020 LET a = 1
8030 LET A$ = "This procedure doesn't
do anthing"
8040 REM ENDPROC
```

does nothing because the two variables a and a$ changed by the proceudre are localised so that when the procedure is terminated they changed back to their original values. Mind you, that's only true if a and a$ were defined when the procedure was called. If they weren't then the Local command would have great difficulty in localising them — it wouldn't stop with an error though — and Endproc would have as much difficulty delocalising them; with the result that Endproc allows the variables to retain their values as defined in the procedure.

(continued on next page)

```
CDC51676FDCB01AEFDCB304EC4CD0E3A
3A5C3CF5210000FD"
1040 DATA 8474,"7537FD7526220B5C
21010022165C3DB016FDCE37AECD6E0D
FDCB02EEF111BFFED61CC34613EB5E23
56EBE970726FE3F1FB6C5F6361EC9DFB
72656361 6CECC4FA"
1050 DATA 7763,"656E6470726FE33E
FB6465667072 6FE367FAC9DFE50EFF0C
DFCD8D2C3003E718F679A73E02CAF3F9
E12B225D5CC5CD1FFE0600030303 0303
CD4FFE23C1712379"
1060 DATA 7892,"C6027723360023EB
E7F62012130D20F8D52A425CCD6E19ED
5B535CB7ED52D1E3732372E7FE0DC8FE
28CE3E010 3F3F9CD09FE7EA72009237E
A73E03CAF3F92B23"
1070 DATA 8832,"7EA73600C84723C5
E5CD0AFB3006CDB819CDE819E1E5CDB6
192A595C2BC5CD551623C1D1EBE5EDB0
E1E5CDB819CD72FFE1C110D3C9EB2A4B
5C7EE67F28294F1A"
1080 DATA 9056,"E67FB920167EE6E0
FEA020195E523131ABE20051730F718
0AE1D1D5CDB819EBD118D6E1D137C3B7
C9CD09FE7EA73E04CAF3F9E523CDD5FA
E123562B5EEBED4B"
1090 DATA 8506,"535C09EBED53555C
E5010200CD8AFEE1010200C372FE2A42
5CCD6E193A445CCAA9F9A7200A477EE6
C078CAA9F9CFFFCF16CD821CDFFECBC2
8A1CC1EF0238EBCD"
1100 DATA 8969,"E934DA9EF9C360F9
CD09FE232254FF23CDB0FBFE0DC33E01
C3F3F9E5CDB2283831200A7EE6E0FE40
3E01C2F3F979E650FE20200052B7E1730
FBCDB81909E3C5CD"
1110 DATA 8723,"9BFE23C1D1EBEDB0
D52A54FF343E01CAF3F9DFFE2CE1C0E5
E7E118BFCD09FE010200CD4FFE23ED5B
555CEBED4B535CB7ED42EB7323722A5D
5C2BE5225D5C0E00"
1120 DATA 8076,"E7CD8D2C30030C18
F779A73E01CAF3F9CD1FFE7EA73E07CA
F3F979BE28082 35E2356231913EDEBE1
```

(continued on next page)

(continued from previous page)

There is one loop-hole to all this, you might want to localise the formal parameters of the procedure. The problem is that you can't because by the time the computer reaches the first line of your procedure the formal variables have already been changed. To save such hassles, before the values of formal variables are changed the computer automatically localises them. Therefore don't try and return values in one of the formal parameters of a procedure, it will only end in disaster.

The last command to be discussed is Recall. Recall is a lonely command, it doesn't have any arguments after it. Recall is much like an Endproc except that it doesn't do 'the return from procedure' bit. What it does do is unlocalise all previously localised variables in a procedure. If you have a great desire to do so, for some obscure reason, you can localise variables outside of a procedure using a combination of Local and Recall commands.

The program adds a number of new error reports to Sinclair Basic. They are produced in much the same way as normal errors, with the exception that they are not preceded by an alphanumeric code. The line where the computer stops because of an error is not always where the error actually is. For instance, if the computer stops with 'Syntax error' or a Proc line then the error might lie with the associated Defproc. Below is a full list of all the new reports and their possible reasons for being produced.

'Invalid procedure name'	— You've tried to give a procedure name that doesn't consist of just letters.
'Data area cleared'	— You've used a clear statement and erased the program's safe cubby hole at the start of the variables area.
'DEFPROC not found'	— You've used Proc with the name of a procedure that doesn't exist.
'Return stack full'	— You can 'only' nest procedures up to a limits of 255 levels. This is the error you'll get if you exceed that limit. This will only normally happen if you manage to write a procedure that calls itself, either directly or indirectly.
'ENDPROC without DEFPROC'	The computer's come across an Endproc and it wasn't executing a procedure at the time.
'PROC parameter error'	— There's either a different number of parameters between the associated Proc and Defproc or some of them aren't of the right type.
'RECALL without LOCAL'	— You've tried to use Recall outside of a procedure without previously using Local.
'Syntax error'	— This can be caused because of a variety of reasons, such as missing out a comma or bracket.

The program can also produce normal Basic errors, most noticeably error C — "Nonsense in Basic" and 2 — "Variable not found".

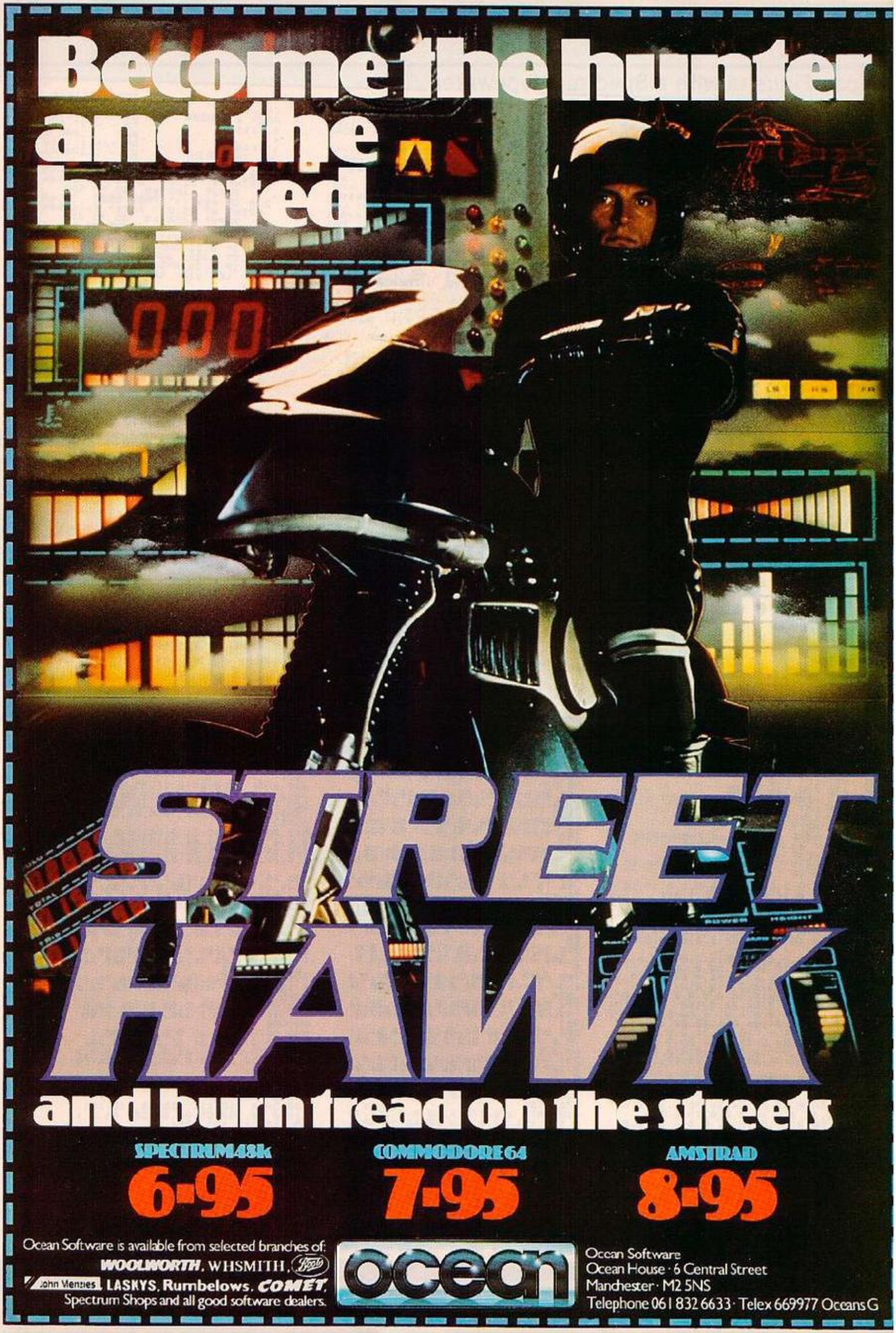
Listing 2 gives a simple demonstration of procedures as applied to a real, if very simple, application. The application I'm talking about is a program that allows you to draw lines around the screen using the cursor keys. ■

(listing 1 continued from previous page)

```
E5D51313225D5C41E7F620EB23BEEB20
0910F5FD7176C1C1"
1130 DATA 6789,"1803E118D913E7D5
FE282815FE0D3E01C2F3F9180CE15E23
562A535C1922555CC9DFE5EB5E2356EB
ED5B535C19110400193AB05C225D5CC6
0847E710FDFE0D20"
1140 DATA 8003,"22E17EFE0D3E05C2
F3F9CD09FE7E3CF53E08CAF3F9010200
CD3EFE23F17723350018B2E7E5CD09FE
7E3CF53E08CAF3F9010200CD9BFE23F1
772336002254FF23"
1150 DATA 8280,"CD30FBE12256FFE1
225D5CE7DFFE222854FE2E280EFE2D28
13CD882C3018CD8D2C3818CD9B2CFDCB
01F6184FE7CD9B2CEF1B38FDCB01F618
423E01C3F3F9CDB2"
1160 DATA 6197,"28382020077EE6E0
FE4020EDFDCB0176200B234E234623EB
CDB22A181E23CDB4331818CF0123E501
00007EFE2228042303 18F7225D5CE7D1
CDB22A3A3B5C32B0"
1170 DATA 7771,"5CDFFE2C2805FE29
20AFE7FE0D20AA1801E72A5D5CED5B56
FFED535D5C2256FFDFCD8D2C3093E5E7
FE24280DCD882C3009E7CD882C38FA18
01E7FE2C2809FE29"
1180 DATA 6870,"28053E01C3F3F9E1
225D5CCDB2283821FD363700200B234E
234623EB3E01CDB22AFDCB0176200ECD
F12BEBFDCB37C61804FD363702ED4372
5C224D5C3AB05CFD"
1190 DATA 8691,"AE01E6403E05C2F3
F9CDFF2ADFFE29280FE7ED5B55FFED53
5D5C2256FFC3E1FCE7FE0DC20EFD2A56
FF7EFE0DCA6AFC3E05C3F3F92A4B5C7E
FE40200923232 35E"
1200 DATA 7746,"23562319C93E06C3
F3F92A4B5C7EFE4020F3232323232 3C9
DFE5DFF6204F1AE67FF620B92009E71A
131730EEE1B7C91A131730FBE1225D5C
37C9CDB3FEC5CD55"
1210 DATA 8007,"16C1E52A4B5C235E
2356EB09EB722B7323235E2356EB09EB
722B73E1C9CDB3FEC5CDE8192A4B5C23
5E2356C1EBB7ED42EE722B73C9CD72FE
23235E2356EBB7ED"
1220 DATA 8105,"42EB722B73C9CDB3
FEC5CD5516C1E52A4B5C235E2356EB09
EB722B73E1C9E52A4B5C7EFE40C21AFE
E1C98053796E7461782065727 26FF249
6E76616C69642070"
1230 DATA 5893,"726F63656475726 5
206E616DE552454341 4C4C2077697468
6F7574204C4F4341 4C454E4450524F43
207769746 86F7574204445465052 4FC3
50524F4320705172"
1240 DATA 643E,"616D557465722065
72726FF24461746120617265612063 6C
65617265E444454650524F43206E5F74
20666F756EE4526574757 26E20737461
636B2066756CEC00"
1250 DATA 0,"000000"
```

Listing 2.

```
10 RANDOMIZE USR 63765
20 LET x=128: LET y=88
30 PLOT x,y
40 REM PROCinput
50 IF a$="5" THEN REM PROCleft
60 IF a$="6" THEN REM PROCdown
70 IF a$="7" THEN REM PROCup
80 IF a$="8" THEN REM PROCright
90 REM PROCwait(3)
100 GO TO 30
1000 REM DEFPROCinput
1010 LET a$=INKEY$
1020 REM ENDPROC
2000 REM DEFPROCwait(delay)
2010 REM LOCAL a
2020 FOR a=1 TO delay
2030 NEXT a
2040 REM ENDPROC
3000 REM DEFPROCleft
3010 LET x=x-1
3020 IF x<0 THEN LET x=0
3030 REM ENDPROC
4000 REM DEFPROCdown
4010 LET y=y-1
4020 IF y<0 THEN LET y=0
4030 REM ENDPROC
5000 REM DEFPROCup
5010 LET y=y+1
5020 IF y>175 THEN LET y=175
5030 REM ENDPROC
6000 REM DEFPROCright
6010 LET x=x+1
6020 IF x>255 THEN LET x=255
6030 REM ENDPROC
```



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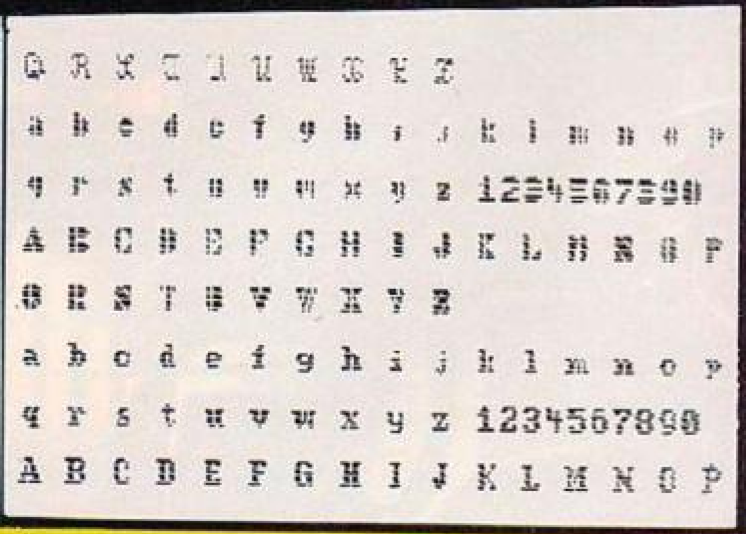
Listing 1.

```
  10 PRINT AT 18,0;"  ": LOAD ""C
ODE
  20 POKE 23607,60: RANDOMIZE US
R 32759: INK 0
  30 LET t=0: LET p=0
  40 LET m1=0: LET d1=0: LET p1=
0: LET c1=1
  50 LET x=0: LET y=0: LET c=p*6
72: LET d=c+49000: POKE 23728,d-
256*INT (d/256): POKE 23729,INT
(d/256): POKE 23681,32: RANDOMIZ
E USR 32800
  60 LET d=c+32850: POKE 23728,d
-256*INT (d/256): POKE 23729,INT
 (d/256): POKE 23681,60: RANDOMI
ZE USR 32800: BORDER 5: CLS
  70 PRINT #0; PAPER 5;"
  PAPER 7;"? for Instructions";
PAPER 5;"
  80 PRINT AT 21,0;"LINE ";x;" "
;AT 21,7;" COLUMN ";y;" ";AT 21,
17;" PAGE ";p;" ";AT 21,25;" "
; INVERSE m1;"M"; INVERSE d1;"D"
; INVERSE p1;"P"; INVERSE c1;"C"
  90 IF y<0 AND x=0 AND p=0 THEN
 LET y=0: GO TO 80
 100 IF y<0 AND x=0 THEN LET p=p
-1: LET x=20: LET y=31: GO TO 80
 110 IF y<0 THEN LET y=32: LET x
=x-1: GO TO 80
 120 LET a$=INKEY$: IF a$="" THE
N GO TO 120
 130 IF a$=" STOP " THEN BEEP .1
,-45: LET m1=1: LET d1=0: LET p1
=0: LET c1=0: GO TO 800
 140 IF a$=" NOT " THEN BEEP .1,-
45: PRINT AT 21,0;"Enter new ink
, paper and border.": INPUT i,pp
: INPUT b: INK i: PAPER pp: BORD
ER b: GO TO 80
 150 IF a$="<=" THEN BEEP .1,-45
: PRINT AT 21,0;" Enter filename
.": INPUT LINE b$: GO TO 640
 160 IF a$=" TO " THEN BEEP .1,-
45: LET p=p+1: LET y=0: LET x=0:
 PRINT AT 21,0;"        Readin
g Page          ": PAUSE 25: LET
 c=672*p: CLS : FOR i=c TO c+671
: POKE 23607,PEEK (32850+i): PRI
NT CHR$ (PEEK (49000+i));: NEXT
i: GO TO 80
 170 IF a$=" STEP " THEN BEEP .1
,-45: PRINT AT 21,0;" Page requi
red.? ": INPUT p: GO TO 540
 180 IF a$=" AND " THEN BEEP .1,
-45: GO TO 20
 190 IF a$=" OR " THEN BEEP .1,-
45: PRINT AT 21,0;" First and La
st line ?   ": INPUT a,b: GO TO 3
40
 200 IF a$="AT " THEN BEEP .1,-4
5: GO TO 40
 210 IF a$="<" THEN GO TO 430
 220 IF a$=">" THEN GO TO 480
 230 IF a$=" THEN " THEN GO TO 4
00
 240 IF a$="*" THEN GO TO 370
 250 IF a$="?" THEN BEEP .1,-45:
 CLS : PRINT "          INSTRUC
TIONS                   ---------
------
chars.                   STOP -select
APER & BORDER            NOT - INK , P
a page                   STEP -select
e                        TO - NEXT Pag
ll Pages                 AND - CLEAR a
nes to PRINT             OR -select li
ge": GO TO 520           AT - CLEAR pa
 260 IF a$="<=" THEN BEEP .1,-45
: PRINT AT 21,0;" Enter filename
.": INPUT LINE b$: GO TO 560
 270 IF a$=">=" THEN BEEP .1,-45
: PRINT AT 21,0;" Enter filename
.": INPUT LINE b$: GO TO 580
 280 BEEP .1,-45: PRINT AT x,y;a
$;: LET y=y+1
 290 IF y>31 AND x=20 AND p=23 T
HEN LET y=31: GO TO 80
 300 IF y>31 AND x=20 THEN LET p
=p+1: LET y=0: LET x=0: PRINT AT
 21,0;"         Reading Page
     ": PAUSE 25: CLS : FOR i=
p*672 TO (p+1)*672: POKE 23607,P
EEK (32850+i): PRINT CHR$ (PEEK
(49000+i));: NEXT i
 310 IF y>31 THEN LET y=0: LET x
=x+1
 320 POKE 49000+c,CODE a$: POKE
32850+c,PEEK 23607: LET c=c+1
 330 GO TO 80
 340 IF a<0 THEN GO TO 190
 350 IF b>20 THEN GO TO 190
 360 LET d=p*672: FOR i=a*32 TO
(b+1)*32-1: POKE 23607,PEEK (328
50+i+d): LPRINT CHR$ (PEEK (4900
0+i+d));: NEXT i: GO TO 80
```



MULT

THIS PROGRAM can mix characters from four character sets on one screen or even on one word. Furthermore it features a page editor with a cursor moving in the four usual directions. Also it is possible to access an instruction page at any time.

Output to the printer doesn't use the Copy command and you can print individual lines.

Enter listing 1 which is the main program.

Listing 2.

```
  10 REM Multi-Font loader
  20 LET t=30464
  25 FOR c=100 TO 1270 STEP 10
  27 LET s=0
  30 FOR n=1 TO 20
  40 READ a: POKE (30464+t),a
  45 LET s=s+a
  50 LET t=t+1
  60 NEXT n
  70 READ m: IF m<>s THEN PRINT
"Error at line ";c: STOP
  80 NEXT c
  90 PRINT "OK - now save the co
de": STOP
100 DATA 0,0,0,0,0,0,0,0,0,16,16
,16,16,0,16,0,0,36,36,0,152
110 DATA 0,0,0,0,0,36,126,36,36,
126,36,0,0,8,62,40,62,10,62,8,54
8
120 DATA 0,98,100,8,16,38,70,0,0
,16,40,16,42,68,58,0,0,8,16,0,59
4
130 DATA 0,0,0,0,0,4,0,0,0,0,4,0
,0,32,16,16,16,16,32,0,168
140 DATA 0,0,20,8,62,8,20,0,0,0,
8,8,62,8,8,0,0,0,0,0,0,212
150 DATA 0,8,8,16,0,0,0,0,62,0,0
,0,0,0,0,0,0,24,24,0,142
160 DATA 0,0,2,4,8,16,32,0,28,34
,34,34,34,34,28,0,4,12,20,4,328
170 DATA 4,4,4,0,28,34,2,2,20,10
,22,0,28,34,2,12,2,34,28,0,300
180 DATA 34,34,34,62,2,2,2,0,62,
32,60,2,2,34,28,0,28,32,60,34,54
4
190 DATA 34,34,28,0,62,2,2,4,8,1
6,16,0,28,34,34,28,34,34,28,0,42
6
200 DATA 28,34,34,34,30,2,28,0,0
,0,0,16,0,0,16,0,0,0,0,16,0,238
210 DATA 0,16,16,32,0,0,4,8,16,8
,4,0,0,0,0,62,0,62,0,0,228
220 DATA 0,0,16,8,4,8,16,0,0,60,
65,4,8,0,8,0,0,60,74,85,418
230 DATA 94,64,60,0,24,36,36,54,
108,37,70,0,60,82,18,28,18,83,36
,0,908
240 DATA 28,34,100,56,32,35,28,0
,30,74,73,41,9,57,54,0,70,02,00,
18,617
250 DATA 56,67,60,0,63,66,68,30,
4,36,27,0,78,82,60,18,15,20,36,2
4,810
260 DATA 114,21,22,60,85,85,34,0
,30,34,18,2,2,35,28,0,30,34,18,2
,654
270 DATA 15,18,34,28,34,34,36,56
,36,34,99,0,78,82,60,16,18,113,1
10,0,981
280 DATA 99,54,51,42,42,42,67,0,
33,50,42,42,42,39,66,0,56,68,74,
66,976
290 DATA 66,67,60,0,60,60,60,38,
4,36,27,0,56,66,74,66,66,91,60,4
,983
300 DATA 60,82,18,28,18,82,35,0,
70,74,60,8,8,76,51,0,63,68,68,4,
873
310 DATA 4,36,27,0,66,34,34,34,3
4,34,29,0,51,82,18,18,18,20,27,0
,566
320 DATA 99,106,40,40,40,20,20,0
,54,73,72,8,10,73,54,0,51,82,18,
28,831
330 DATA 16,24,23,0,59,71,8,28,8
,113,10,0,0,14,8,8,8,8,14,0,520
340 DATA 0,0,64,32,16,8,4,0,0,11
2,16,16,16,16,112,0,0,16,56,84,5
68
350 DATA 16,16,16,0,0,0,0,0,0,0,
0,255,0,28,34,120,32,32,126,0,67
5
360 DATA 0,0,30,34,34,98,157,0,2
4,36,36,40,52,39,216,0,0,0,28,34
,858
370 DATA 32,99,156,0,2,2,2,30,34
,98,157,0,0,0,28,34,36,24,247,0,
981
380 DATA 8,20,20,24,60,219,24,16
,0,0,30,34,34,223,2,28,24,36,36,
40,878
390 DATA 56,36,231,0,0,8,0,8,8,2
2,227,0,4,0,4,12,54,221,36,24,94
3
400 DATA 36,32,36,40,18,40,231,0
,24,36,36,36,40,48,223,0,0,0,34,
170,1156
410 DATA 170,170,41,0,0,0,108,14
5,146,146,17,0,0,0,28,42,39,95,1
56,0,1307
420 DATA 0,16,28,50,82,147,16,16
,0,0,30,34,34,223,2,2,0,0,46,50,
788
430 DATA 16,16,227,0,0,8,8,20,34
,67,140,0,8,63,8,8,8,20,227,0,88
2
440 DATA 0,0,34,34,34,98,157,0,0
,0,38,87,82,146,28,0,0,0,65,73,8
76
450 DATA 73,85,182,0,0,0,54,73,7
3,137,54,0,0,0,34,34,34,223,2,28
,1065
460 DATA 0,0,28,36,78,149,36,24,
0,14,3,48,8,8,14,0,0,8,8,8,475
470 DATA 8,8,8,0,0,112,16,12,16,
16,112,0,0,20,40,0,0,0,0,0,368
480 DATA 60,66,153,161,161,153,6
6,60,0,0,0,0,0,0,0,0,24,24,24,24
,976
490 DATA 24,0,24,0,54,36,0,0,0,0
,0,0,0,54,119,54,54,119,54,0,598
500 DATA 0,8,22,58,28,46,52,8,98
,102,12,24,48,102,70,0,24,50,0,2
5,787
510 DATA 61,98,61,0,24,16,0,0,0,
0,0,0,12,28,24,24,24,28,12,0,412
520 DATA 24,28,12,12,12,28,24,0,
0,0,54,28,0,28,54,0,0,0,24,24,35
2
530 DATA 126,24,24,0,0,0,0,0,0,2
4,24,16,0,0,0,0,126,0,0,0,364
540 DATA 0,0,0,0,0,28,28,0,6,6,1
2,12,24,24,0,0,52,118,118,118,54
6
550 DATA 118,118,52,0,24,24,68,2
4,24,24,126,0,60,126,0,14,56,96,
126,0,1100
560 DATA 60,126,0,32,0,126,60,0,
96,96,108,108,46,12,12,0,126,126
,64,124,1352
570 DATA 0,126,60,0,60,126,64,11
6,118,110,52,0,126,126,0,12,24,4
8,48,0,1221
580 DATA 60,126,0,30,0,126,60,0,
44,110,110,46,2,126,60,0,0,0,28,
28,986
590 DATA 0,28,28,0,0,0,28,28,0,1
2,12,8,0,0,12,24,48,24,12,0,284
600 DATA 0,0,0,126,0,126,0,0,0,0
,48,24,12,24,48,0,30,126,0,14,60
8
610 DATA 21,0,24,0,30,33,77,85,7
9,32,30,0,3,28,28,16,46,119,119,
0,808
620 DATA 110,111,110,96,110,111,
110,0,46,102,96,96,96,102,46,0,1
08,110,110,110,1784
630 DATA 110,110,108,0,110,102,9
8,104,98,102,110,0,110,102,98,10
4,96,96,96,0,1754
640 DATA 46,102,98,96,102,102,46
,0,102,102,102,118,102,102,102,0
,28,28,28,28,1434
650 DATA 28,28,28,0,14,14,14,14,
110,110,44,0,110,108,104,96,104,
108,110,0,1144
660 DATA 96,96,96,96,98,102,110,
0,102,118,118,102,102,102,102,0,
110,118,122,00,1050
670 DATA 94,110,118,0,44,110,110
,110,110,110,44,0,102,110,110,10
```

```
 370 IF x<=0 AND p=0 THEN LET x=
0: LET p=0: GO TO 80
 380 IF x=0 THEN LET x=21: LET p
=p-1: CLS : FOR i=p*672 TO (p+1)
*672: POKE 23607,PEEK (32850+i):
 PRINT CHR$ (PEEK (49000+i));: N
EXT i
 390 BEEP .1,-45: POKE 23607,PEE
K (32850+c): PRINT AT x,y;CHR$ (
PEEK (49000+c)): LET x=x-1: PRIN
T AT x,y;"▪": LET c=c-32: GO TO
80
 400 IF x>=20 AND p=23 THEN LET
x=20: GO TO 80
 410 IF x>19 THEN LET x=-1: LET
p=p+1: CLS : FOR i=p*672 TO (p+1
)*672: POKE 23607,PEEK (32850+i)
: PRINT CHR$ (PEEK (49000+i));:
NEXT i
 420 BEEP .1,-45: POKE 23607,PEE
K (32850+c): PRINT AT x,y;CHR$ (
PEEK (49000+c)): LET x=x+1: PRIN
T AT x,y;"▪": LET c=c+32: GO TO
80
 430 IF y<=0 AND x=0 AND p=0 THE
N LET y=0: LET c=0: GO TO 80
 440 IF y=0 AND x=0 THEN CLS : L
ET y=32: LET x=20: LET p=p-1: FO
R i=p*672 TO (p+1)*672: POKE 236
07,PEEK (32850+i): PRINT CHR$ (P
EEK (49000+i));: NEXT i
 450 IF y<=0 THEN LET y=32: LET
x=x-1
 460 BEEP .1,-45: LET y=y-1: POK
E 23607,PEEK (32850+c): PRINT AT
 x,y;"▪ ";CHR$ (PEEK (49000+c))
 470 LET c=c-1: GO TO 80
 480 IF y>31 AND x=20 AND p=23 T
HEN LET y=31: LET c=c-1: GO TO 8
0
 490 IF y=32 AND x=20 THEN CLS :
 LET y=0: LET x=0: LET p=p+1: FO
R i=p*672 TO (p+1)*672: POKE 236
07,PEEK (32850+i): PRINT CHR$ (P
EEK (49000+i));: NEXT i
 500 IF y>31 THEN LET y=0: LET x
=x+1
 510 BEEP .1,-45: LET y=y+1: POK
E 23607,PEEK (32850+c): PRINT AT
 x,y-1;CHR$ (PEEK (49000+c));"▪"
: LET c=c+1: GO TO 80
 520 PRINT "                <= - SAVE pag
e                        >= - LOAD pag
e                        <> - SAVE scr
een                      THEN -one lin
e down                   ↑ -one line u
p                        < -backwards
                         > -forwards
                         ? -instructio
ns                       C.SHIFT & S.S
HIFT - ?
                            PRESS ANY K
EY": PAUSE 0
 530 PRINT AT 21,0;"            Re
ading page           ": PAUSE 25:
 CLS : FOR i=p*672 TO (p+1)*672:
 POKE 23607,PEEK (32850+i): PRIN
T CHR$ (PEEK (49000+i));: NEXT i
: GO TO 80
 540 IF p<0 OR p>23 THEN GO TO 1
70
 550 LET y=0: LET x=0: PRINT AT
21,0;"           Reading page
    ": PAUSE 25: LET c=672*p:
CLS : FOR i=c TO c+671: POKE 236
07,PEEK (32850+i): PRINT CHR$ (P
EEK (49000+i));: NEXT i: GO TO 8
0
 560 IF LEN b$>10 THEN GO TO 260
 570 PRINT AT 21,0;" Saving page
 ";p;"    ": SAVE "Page "CODE 3285
0+p*672,672: SAVE b$CODE 49000+p
*672,672: GO TO 80
 580 IF LEN b$>10 THEN GO TO 270
 590 PRINT AT 21,0;" Loading pag
e ";p: LOAD "Page:"CODE 32850+p*
672: LOAD b$CODE 49000+p*672: GO
 TO 530
 600 IF PEEK 23607=60 THEN POKE
23607,118: LET m1=1: LET d1=0: L
ET p1=0: LET c1=0: GO TO 80
 610 IF PEEK 23607=124 THEN POKE
 23607,60: LET m1=0: LET d1=0: L
ET p1=0: LET c1=1: GO TO 80
 620 IF PEEK 23607=118 THEN POKE
 23607,121: LET m1=0: LET d1=1:
LET p1=0: LET c1=0: GO TO 80
 630 IF PEEK 23607=121 THEN POKE
 23607,124: LET m1=0: LET d1=0:
LET p1=1: LET c1=0: GO TO 80
 640 IF LEN b$>10 THEN GO TO 150
 650 PRINT AT 21,0;"
          ": SAVE b$SC
REEN$ : GO TO 80
 660 SAVE "Typewriter" LINE 10:
SAVE "M.F.T.Code"CODE 30464,2355
: PRINT "Verify Basic": VERIFY "
": PRINT "Verify Code": VERIFY "
"CODE
```

TIFONT

Multi-Font Typewriter

Save and verify it with any file-name.

Enter listing 2 which creates a machine code file. When you have run it, save the machine code with:

SAVE "M.F.T.Code" CODE 30464,2355

Now load the main program and run it and it will ask for the machine code. Once you have them together save and verify them by entering Goto 660.

```
8,96,96,95,0,1684
680 DATA 44,110,110,110,102,106,
44,0,106,110,110,108,96,108,110,
0,46,116,122,60,1722
690 DATA 94,110,116,0,90,90,24,2
4,24,24,24,0,110,110,110,110,110
,110,44,0,1324
700 DATA 119,119,46,46,28,28,8,0
,117,109,42,42,26,20,20,0,119,54
,20,20,983
710 DATA 54,54,119,0,118,118,44,
44,24,24,24,0,118,110,94,60,122,
118,110,0,1355
720 DATA 28,24,24,24,24,24,28,0,
48,48,24,24,12,12,6,0,28,12,12,1
2,414
730 DATA 12,12,28,0,24,60,90,90,
24,24,24,24,0,0,0,0,0,0,255,255,
922
740 DATA 20,54,48,120,50,62,126,
0,0,0,20,5,22,54,22,0,48,48,52,5
4,808
750 DATA 54,54,52,0,0,0,28,62,32
,52,28,0,5,6,22,54,54,54,22,0,59
0
760 DATA 0,0,20,54,48,54,28,0,12
,24,60,24,24,24,24,0,0,0,22,54,4
72
770 DATA 54,22,4,24,48,48,52,54,
54,54,54,0,0,24,0,24,24,24,24,0,
556
780 DATA 0,12,0,12,12,12,44,0,48
,48,54,52,48,52,54,0,24,24,24,24
,552
790 DATA 24,24,24,0,0,0,104,106,
106,106,106,0,0,0,52,54,54,54,54
,0,666
800 DATA 0,0,20,54,54,54,20,0,0,
0,52,54,54,52,48,48,0,0,22,54,58
6
810 DATA 54,22,6,6,0,0,52,54,40,
48,48,0,0,0,22,58,28,46,52,0,544
820 DATA 8,24,60,24,24,26,8,0,0,
0,54,54,54,54,22,0,0,0,54,54,520
830 DATA 54,20,20,0,0,0,106,106,
106,98,34,0,0,0,34,54,20,54,34,0
,740
840 DATA 0,0,54,54,54,22,4,24,0,
0,54,46,28,58,54,0,12,24,24,48,5
60
850 DATA 24,24,12,0,24,24,24,24,
24,24,24,0,48,24,24,12,24,24,48,
0,452
860 DATA 58,108,0,0,0,0,0,0,60,6
6,153,161,161,153,66,60,0,0,0,0,
1046
870 DATA 0,0,0,0,24,24,24,24,24,
0,24,0,54,36,0,0,0,0,0,0,234
880 DATA 0,54,127,54,54,127,54,0
,0,8,28,48,28,38,60,8,98,102,12,
24,924
890 DATA 48,102,70,0,0,24,52,25,
61,98,61,0,24,16,0,0,0,0,0,0,581
900 DATA 12,28,24,24,24,28,12,0,
24,28,12,12,12,28,24,0,0,0,34,20
,346
910 DATA 62,20,34,0,0,0,24,24,12
6,24,24,0,0,0,0,0,0,24,24,16,402
920 DATA 0,0,0,0,126,0,0,0,0,0,0
,0,0,28,28,0,6,6,12,12,218
930 DATA 24,24,0,0,60,110,110,11
8,118,102,60,0,24,56,120,24,24,2
4,126,0,1124
940 DATA 60,102,6,28,48,102,126,
0,60,102,6,60,6,102,60,0,96,108,
108,126,1306
950 DATA 12,12,12,0,126,96,124,6
,6,102,60,0,60,96,124,102,102,10
2,60,0,1202
960 DATA 126,102,12,24,48,48,48,
0,60,102,102,60,102,102,60,0,60,
102,102,102,1362
970 DATA 62,6,60,0,0,0,28,28,0,2
8,28,0,0,0,28,28,0,12,12,8,328
980 DATA 0,0,12,24,48,24,12,0,0,
0,0,126,0,126,0,0,0,0,48,24,444
990 DATA 12,24,48,0,60,102,6,12,
24,0,24,0,30,33,77,85,79,32,30,0
,678
1000 DATA 56,24,44,44,126,70,239
,0,252,102,102,124,102,102,252,0
,58,102,102,96,1997
1010 DATA 96,102,60,0,252,102,10
2,102,102,252,0,126,54,48,60
,48,54,126,0,1788
1020 DATA 126,54,48,60,48,48,120
,0,60,102,96,110,102,102,58,0,11
0,54,54,62,1423
1030 DATA 54,54,119,0,60,24,24,2
4,24,24,60,0,30,12,12,12,108,108
,56,0,805
1040 DATA 115,50,52,56,52,50,115
,0,120,48,48,48,48,54,126,0,199,
110,110,86,1467
1050 DATA 86,70,239,0,99,50,58,5
2,46,38,115,0,60,102,102,102,102
,102,60,0,1493
1060 DATA 252,102,102,124,96,96,
240,0,60,102,102,102,118,110,60,
0,252,102,102,124,2246
1070 DATA 102,102,227,0,58,102,9
6,60,6,102,92,0,126,90,90,24,24,
24,60,0,1385
1080 DATA 239,70,70,70,70,70,60,
0,239,70,70,70,44,44,16,0,199,86
,86,86,1359
1090 DATA 44,44,40,0,247,98,52,6
0,44,70,239,0,247,98,96,52,24,24
,60,0,1541
1100 DATA 126,102,12,24,48,102,1
26,0,28,24,24,24,24,24,28,0,48,4
8,24,24,360
1110 DATA 12,12,6,0,28,12,12,12,
12,12,28,0,24,60,90,90,24,24,24,
24,506
1120 DATA 0,0,0,0,0,0,255,255,28
,54,48,120,48,54,126,0,0,0,56,12
,1056
1130 DATA 60,108,54,0,112,48,50,
54,54,54,100,0,0,0,50,102,96,102
,60,0,1130
1140 DATA 28,12,60,108,108,108,5
4,0,0,0,50,102,126,96,60,0,12,24
,60,24,1342
1150 DATA 24,24,60,0,0,0,58,102,
102,62,6,60,112,48,60,54,54,54,1
19,0,999
1160 DATA 0,24,0,56,24,24,60,0,0
,12,0,28,12,12,44,24,112,48,54,5
2,586
1170 DATA 56,52,112,0,56,24,24,2
4,24,24,30,0,0,0,212,106,106,106
,236,0,1207
1180 DATA 0,0,108,54,54,54,113,0
,0,0,60,102,102,102,60,0,0,0,108
,54,977
1190 DATA 54,60,48,112,0,0,54,10
8,108,60,12,30,0,0,108,54,48,48,
120,0,1024
1200 DATA 0,0,28,46,28,38,60,0,8
,24,62,24,24,28,12,0,0,0,119,54,
555
1210 DATA 54,54,27,0,0,0,119,54,
54,28,8,0,0,0,235,106,106,118,34
,0,997
1220 DATA 0,0,118,52,24,44,113,0
,0,0,102,102,102,62,6,60,0,0,126
,76,984
1230 DATA 24,50,126,0,12,24,24,4
8,24,24,12,0,24,24,24,24,24,24,2
4,0,536
1240 DATA 48,24,24,12,24,24,48,0
,58,108,0,0,0,0,0,0,60,66,153,16
1,810
1250 DATA 161,153,66,60,0,33,32,
128,1,0,33,62,60,119,35,11,120,1
77,32,247,1610
1260 DATA 33,104,191,1,0,60,62,0
2,119,35,11,120,177,32,247,201,4
2,176,92,1,1739
1270 DATA 160,2,58,129,92,119,35
,11,120,177,32,246,201,0,0,0,0,0
,0,0,1383
```

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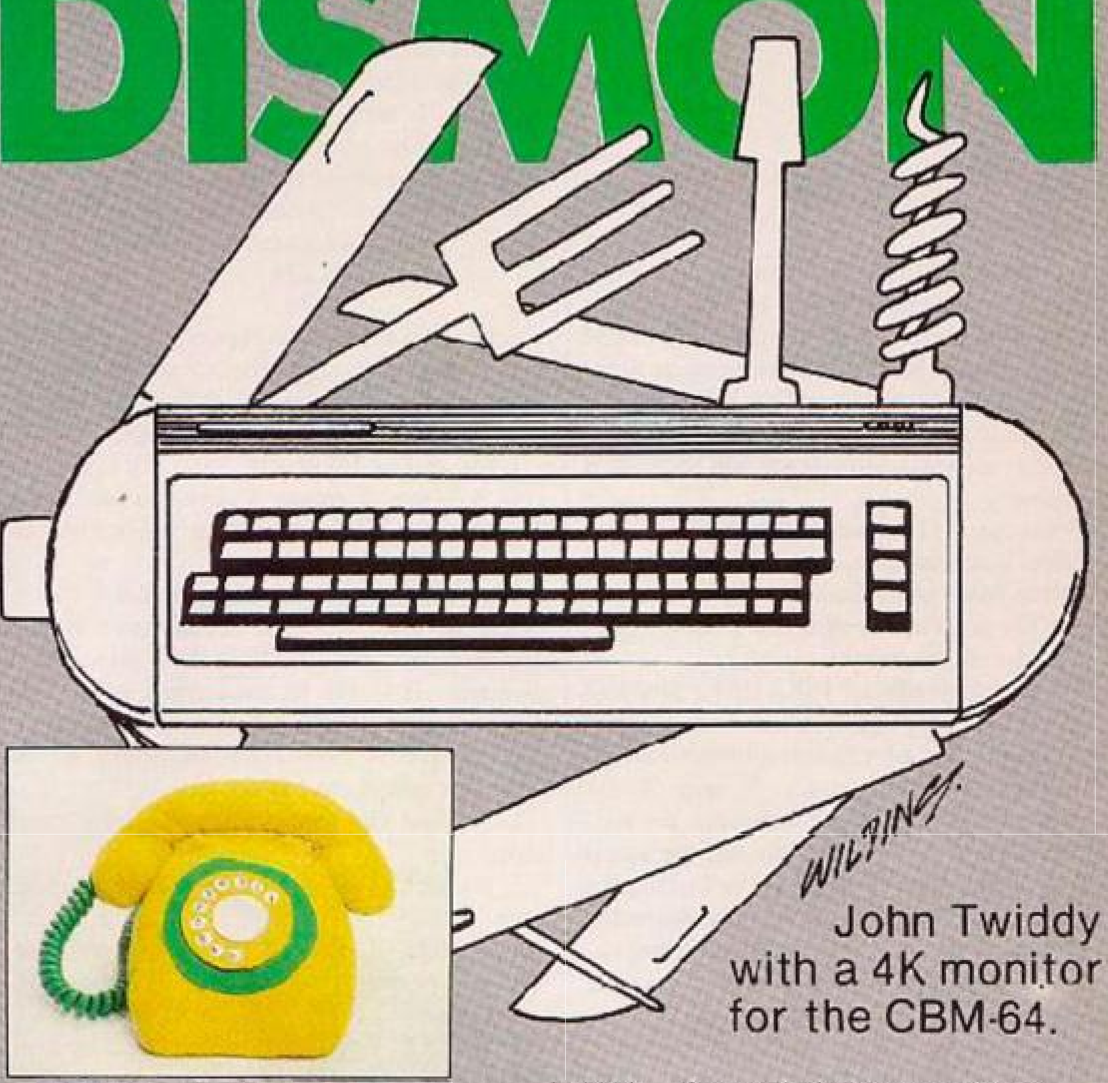
DISMON



John Twiddy with a 4K monitor for the CBM-64.

THE FOLLOWING monitor which is easily as good as any you would buy in a shop, is 4K long and resides in memory at 49152-53247 ($C000-$CFFF hex). The reason for its position at the top of memory is in order to keep it out of the way of any Basic or machine code program you are working on at the time. Although, as explained later, it can easily be moved elsewhere if desired. Due to the fact that the program is placed at $C000, it is not necessary to move any of Basic's pointers to protect it from being corrupted and even if you relocate it into the Basic memory area, it will automatically check if it is below the top of memory pointer and move the pointer down to protect itself if necessary.

Before I go into all the advanced features of the Dismon program, I will first explain how to enter the program. You should type in the Basic Hex loader program — listing 1 — along with all the data statements containing the hex dump — listing 2. Once this is complete, you should save the Basic program in the normal way and then Run it. The hex loader has many integral checks so that it should be able to trap out any typing errors you've made, giving the type of error and where it occurred. In the unlikely situation of Basic giving an error — such as type mismatch error — then typing Goto 300 should yield whereabouts the error occurred.

Assuming the program has run successfully, you should now enter Dismon by typing the command:

SYS 49152

All going well, it will display a copyright message and several lines showing the present state of the microprocessor's registers. I will explain the meaning of these later but for now you should make use of the save command within Dismon to save the machine-code program itself by entering the line:

S "DISMON 64",01,C000,D00C,01

If you wish to save it to disc, replace the first 01 by a 08. The other parameters of the above command are explained fully later. In order to load the saved Dismon program back later, you would type

LOAD"DISMON 64",1,1

or

LOAD"DISMON 64",8,1

depending on whether you use cassette or disc, followed by typing New in order to set the end of program points back.

This program is available on the Telsoft service

Once Dismon is entered by the command SYS49152, there are, in addition to the normal screen editing facilities, two special functions:

F1: Clears screen from the cursor position to the end of the line.
F3: Clears screen from the cursor position to the bottom of the screen.

Commands are entered by typing a single alphabetic command character followed by the appropriate parameters.

The various forms of each command are detailed below. The abbreviations are:

ssss	four digit start address
eeee	four digit end address
dddd	four digit destination address
dd	two digit device number
bb	two digit byte value

Any of the above numbers used in any command are assumed to be in hexadecimal so no dollar sign is necessary but decimal can be implied instead by enclosing the number within two decimal points. (E.g. D 2000 is exactly the same ass D .8192.) The format of all commands is critical including all spaces.

I will deal with each command in alphabetic order showing the different options available within each command:

A ssss — Start assembly mode. The program than automatically displays > ssss and positions the cursor ready to allow you to continue typing the opcode and operand of each line in turn, a null line terminating assembly. In addition to being able to specify the operand in hex or decimal, it may also be input as the Ascii value of a character by preceding it with an apostrophe or as the screen value of a character by preceding it with an exclamation mark.

The operand of a branch instruction may also be specified in one of two ways. It may be inut as a single byte branch factor or as a two byte absolute destination address. One very useful feature is that you are able to input large quantities of NOP or BRK instructions in one go by placing the quantity required, up to 255, after the instruction itself. For example NOP 07 would place 7 NOPs. The above is best clarified by an example:

```
.A 1800
.> 1800 LDX #03
.> 1802 LDA #!M
.> 1804 STA 1024,X
.> 1807 LDA #'N
```

Listing 1.

```
100 PRINT"{CLR}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}  WRITING
 DATA TO MEMORY - PLEASE WAIT{CUR DN}{CUR DN}{CUR DN}"
110 S=49152:N=-1:TC=0
120 BC=0
130 LC=0
140 N=N+1:READA$:IFA$="END"THEN250
150 IFLEN(A$)<>2THEN300
160 H=ASC(LEFT$(A$,1))-48:IFH>9THENH=H-7
170 L=ASC(RIGHT$(A$,1))-48:IFL>9THENL=L-7
180 V=16*H+L:IFV<0ORV>255THEN300
190 PRINTTAB(17)"{CUR UP}"S+N:POKES+N,V:LC=LC+V
200 IF(N+1)AND7THEN140
210 READA$:A=VAL(A$):IFLC<>ATHEN400
220 BC=BC+LC:IF(N+1)AND63THEN130
230 READA$:A=VAL(A$):IFBC<>ATHEN500
240 TC=TC+BC:GOTO120
250 READA$:A=VAL(A$):IFA<>TCTHEN600
260 IFN<>4096THEN600
270 PRINT"{CLR}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR DN}PROGRAM H
AS BEEN ENTERED CORRECTLY"
280 PRINT"{CUR DN}TYPE 'SYS 49152' TO RUN DISMON."
290 END
300 PRINT"{CUR DN}{CUR DN}INVALID BYTE IN LINE";1000+10*INT(N/8):END
400 PRINT"{CUR DN}{CUR DN}CHECKSUM ERROR IN LINE";1000+10*INT(N/8):END
500 PRINT"{CUR DN}{CUR DN}BLOCK ERROR IN LINES";
510 PRINT1000+80*INT(N/64);"TO";1070+80*INT(N/64):END
600 PRINT"{CUR DN}{CUR DN}***** OVERALL CHECKSUM ERROR *****":END
```

(continued on next page)

(continued from previous page)

```
.> 1809 JSR FFD2
.> 180C NOP 04
.> 1810 DEX
.> 1811 BNE 18C2
.> 1813 BEQ 01
.> 1815 BRK
.> 1816 RTS
.> 1817
```

C ssss eeee dddd — This compares the block of memory ssss-eeee with the block starting at dddd onwards and prints out the addresses of any differences. It may be terminated by Stop.

D — Continue disassembling from the last place referenced.

D ssss — Disassemble from ssss to the end of memory.

D ssss eeee — Disassemble from ssss to eeee. When disassembling, each line is shown one at a time followed by the monitor waiting for a single key press or the shift key. Pressing Stop terminates disassembly.

While disassembling JSR, JMP, Absolute and Zero page references and branch instructions, the operand destination may be 'followed' by pressing the F key. If the instruction is a memory reference — e.g., LDA 3D73,X — then it shows you the actual values of the bytes whereas if the instruction is a JSR, JMP or Branch then disassembly continuous at the operand destination. Pressing R returns to the point of the previous follow command. Follows may be nested up to 16 times.

If the monitor comes across large blocks of NOP or BRK instructions (more than three), it accumulates them into one line. For example:

> 201D — 203F NOP

E ssss — Allows you to Enter Ascii text into memory from ssss onwards. Ascii text and control characters are entered from the keyboard — delete removes the last character, replacing it with a zero byte. This mode is terminated by pressing stop in which case it displays the address of the next character that

H n . . . . — Prints out the hexadecimal of the n . . . . decimal number. For example:

```
.H 326
.0146
```

I bb ssss eeee — increment the block of memory ssss-eeee by the value bb. Incrementing by the hex value FF would of course have the effect of decreasing by one.

J ssss or J or JN ssss or JN — As G except that it places a return address on the stack allowing an RTS terminated subroutine to return to Dismon.

K — This is a very useful command which resets the VIC chip back to its original values and also switches off all the SID chip sound channels. It would be used when you break out of a program using a BRK instruction or Restore and the definable characters, hi-res screen or sound are left on.

L — Load any program into memory from tape.

L "TEST" — Load named program from tape.

L "TEST 2" dd — Load named program from either disc or tape — dd = 01 = tape, dd = 08 = disc.

L "TEST 3" dd ssss — Relocated load — Load named program and place it in memory from ssss onwards instead of where it was saved from.

M ssss — Display eight bytes of memory from ssss onwards.

M ssss eeee — Display memory bytes from ssss to eeee. The printing can be temporarily frozen by pressing a key or stopped by pressing Stop. The Ascii representation of the bytes are also displayed on the right of the screen with a dot representing an unprintable character. Any byte can be altered by changing the displayed value using normal screen editing.

N ssss eeee ssss eeee dddd — New locate. Despite the apparent complexity of this command, it is a very useful function and not too hard to use. It enables you to relocate a program so that it can be executed at another position in memory by changing any references to within one area of memory to point to another area. The program will relocate all JSR, JMP, Absolute, Zero page and Branch references and will indicate an error if a branch reference goes out of range or a zero page reference becomes absolute. Each reference that is changed is first displayed on screen and then it waits for you to press a key or press Shift before the next is done.

If, while searching through the program to be relocated, the routine comes across any invalid opcodes, then it displays the position of the byte and its value and then continues after waiting for a key. The reason for this information being displayed is that it might inadvertently change some data table which it thought was a proper reference.

The parameters of the command have the following purpose. The first ssss-eeee range specifies the area of memory through which Dismon will search, looking for any references to within the second ssss-eeee block and changing them to point to the block of

Listing 2.

```
1000 DATA 09,40,0A,40,90,40,A2,0E,690
1010 DATA A0,E2,20,BC,C6,AD,5C,C0,1261
1020 DATA 8D,16,03,AE,5D,C0,8E,17,790
1030 DATA 03,E4,30,B0,0D,E9,2F,B0,932
1040 DATA 01,C4,05,37,85,33,86,30,765
1050 DATA 86,34,A2,02,8E,56,02,2C,624
1060 DATA A2,01,86,1F,60,A0,60,0A,874
1070 DATA 60,20,C5,C1,60,85,2A,60,989,6845
1080 DATA 38,E5,1F,90,30,02,A0,E9,876
1090 DATA 00,8D,51,02,8A,86,26,20,614
1100 DATA 67,C1,20,3B,C2,A9,15,65,986
1110 DATA 83,D0,24,4C,30,C0,A9,26,986
1120 DATA 06,19,A9,00,08,1A,AD,08,683
1130 DATA 60,A5,9A,C9,03,D0,F9,AD,1249
1140 DATA 8D,02,D0,F4,A5,C6,F0,F1,1439
1150 DATA 20,3E,F1,C9,03,D0,E9,A9,1149,7792
1160 DATA 0A,85,78,85,A9,85,A0,24,1095
1170 DATA 26,9A,20,3F,C3,78,A2,E1,765
1180 DATA BD,C8,C6,9D,8F,02,CA,10,1107
1190 DATA F7,A5,08,C9,03,B0,12,49,1054
1200 DATA 01,4A,09,06,AA,B6,C6,69,761
1210 DATA 1D,98,76,02,CA,D0,FA,65,1099
1220 DATA 0B,58,20,80,C0,4C,7F,C0,1030
1230 DATA 20,E5,C3,F0,C2,C9,2E,F0,1377,8210
1240 DATA F7,C9,20,F0,F3,78,A2,40,1317
1250 DATA A0,E8,0C,90,02,8E,8F,02,950
1260 DATA 58,C9,43,90,0A,CD,00,CE,921
1270 DATA 80,05,E9,3D,AA,D0,07,F2,1022
1280 DATA 04,D8,0D,CD,D0,24,06,08,950
1290 DATA 04,0A,AA,BD,0A,CE,6D,5C,924
1300 DATA C8,A0,BB,00,CE,AA,29,7F,1104
1310 DATA 6D,5B,C0,40,90,40,8A,10,834,8060
1320 DATA 05,20,E1,C4,20,EA,C1,4C,974
1330 DATA 0B,C.,C6,10,04,E0,60,19,1153
1340 DATA A4,A9,09,85,1A,A0,03,A9,839
1350 DATA 13,D.,19,D0,0A,B9,A0,CE,971
1360 DATA 08,10,F6,8A,20,37,C1,E6,1346
1370 DATA 1A,A5,1A,C7,D0,70,C6,47,1167
1380 DATA 3F,20,5F,C3,4C,7F,C0,4C,838
1390 DATA 19,00,70,AE,FE,C6,AC,FF,1198,8250
1400 DATA C6,24,0B,10,06,AE,54,02,655
1410 DATA AC,55,02,8E,18,03,8C,19,523
1420 DATA 03,AE,52,02,AC,53,02,8E,650
1430 DATA 14,03,8C,15,03,A6,28,A4,557
1440 DATA 29,A5,8D,8D,00,DC,A5,2A,915
1450 DATA 60,AE,10,03,AC,19,03,EC,733
1460 DATA FE,C6,D0,05,CC,FF,C6,F0,1562
1470 DATA 06,8E,54,02,8C,55,02,AD,634,6309
1480 DATA 14,03,8D,52,02,AD,15,03,445
1490 DATA 8D,53,02,78,A2,47,A0,FE,973
1500 DATA 8E,18,03,8C,19,03,A2,FF,754
1510 DATA 0E,02,DC,E0,0E,03,DC,2C,1005
1520 DATA 56,02,30,1E,A5,01,29,06,347
1530 DATA 05,01,0E,1A,D0,A9,7F,8D,947
1540 DATA 0D,DC,8D,0D,DD,A2,2C,20,814
1550 DATA 8D,FC,A9,01,8D,0D,DC,8D,1254,6559
1560 DATA 8E,DC,58,D8,60,85,27,86,940
1570 DATA 28,84,29,A0,A4,85,26,A0,A24
1580 DATA 20,DC,85,8D,D0,60,38,A5,1027
1590 DATA 18,E5,19,85,0F,A5,1C,E5,979
1600 DATA 1A,A4,A6,F0,01,18,A0,05,796
1610 DATA 0F,60,A2,02,A5,19,95,19,767
1620 DATA A5,14,95,1A,60,AD,50,02,717
1630 DATA 85,19,AD,51,02,85,1A,60,669,5568
1640 DATA A5,19,8D,50,02,A5,1A,8D,745
1650 DATA 51,02,60,20,68,CA,A2,08,690
1660 DATA A0,00,B.,19,9D,40,02,20,617
1670 DATA 64,C3,20,27,C2,CA,D0,F2,1212
1680 DATA 60,E6,1D,D0,02,E6,1E,E6,1055
1690 DATA 19,D0,06,E6,1A,D0,02,E6,935
1700 DATA A0,60,A5,19,D0,02,C6,1A,800
1710 DATA C6,19,60,A0,05,A2,2A,20,720,5862
1720 DATA 8C,C6,8D,51,02,20,29,C3,926
1730 DATA 8D,50,02,20,64,C3,E8,E8,1062
1740 DATA E0,06,98,EE,30,5E,C0,20,942
1750 DATA .0,C2,A0,08,A5,2A,0A,AA,765
1760 DATA A9,20,98,02,69,A4,20,3F,743
1770 DATA C3,8A,88,D0,F1,60,20,E5,1275
1780 DATA C5,F0,FA,4C,F1,C4,20,4F,1348
1790 DATA C2,20,50,C3,20,50,C3,40,981,8054
1800 DATA 00,A6,19,8A,20,32,C3,20,646
1810 DATA 56,C3,E8,08,D0,F5,20,36,1348
1820 DATA C1,90,21,20,08,C2,A0,00,775
1830 DATA B9,40,02,2C,B4,C2,D0,02,879
1840 DATA A9,2E,20,5F,C3,08,D0,F0,1121
1850 DATA A5,C6,F0,E2,20,74,C0,20,1201
1860 DATA 74,C0,D0,DA,60,20,E4,C4,1286
1870 DATA A2,00,F0,03,20,E1,C4,A5,1023,8279
1880 DATA 19,9D,50,02,A5,1A,9D,51,693
1890 DATA 02,E8,E8,E0,06,90,ED,20,1109
1900 DATA 5E,C0,D0,05,20,E4,C4,A2,1117
1910 DATA 08,20,E5,C3,F0,0D,20,5D,858
1920 DATA C3,A0,00,91,19,20,27,C2,790
1930 DATA CA,D0,EE,60,68,60,4C,78,1151
1940 DATA E3,60,60,20,E5,C3,F0,0E,1145
1950 DATA C9,4E,D0,04,60,08,D0,F3,1103,8040
1960 DATA 20,E4,C4,20,00,C2,A0,51,936
1970 DATA 02,40,A3,50,02,40,20,3A,491
1980 DATA C1,40,A5,27,40,60,60,20,773
1990 DATA E3,C2,20,C8,C1,4C,4C,C0,985
2000 DATA A2,00,B5,1A,20,29,C3,B5,818
2010 DATA 19,40,4A,4A,4A,4A,20,34,477
2020 DATA C3,68,29,0F,C9,0A,90,02,712
2030 DATA 69,06,69,30,4C,5F,C3,A9,799,6209
2040 DATA 2E,A2,0D,DE,02,A9,20,40,704
2050 DATA 0A,20,5F,C3,60,4C,5F,C3,930
2060 DATA 20,E3,C3,20,56,C3,20,59,744
2070 DATA C3,A9,20,DE,02,A9,0D,C6,986
2080 DATA 8E,4C,D2,FF,20,29,C3,4C,1027
2090 DATA 59,C3,23,DE,C3,20,DD,C3,1180
2100 DATA E6,2A,13,FC,C9,2E,F0,24,1191
2110 DATA 20,6A,C3,0E,0A,0A,0A,85,538,7300
2120 DATA 8F,20,87,C3,05,8F,60,20,781
2130 DATA 3D,C3,38,E9,30,C9,0A,90,1108
2140 DATA 8A,C9,11,90,4D,E9,07,C9,390
2150 DATA 10,B0,47,60,A9,00,85,B0,837
2160 DATA 85,B1,20,E5,C3,F0,33,C9,1250
2170 DATA 2E,F0,2F,E9,30,C9,0A,B0,1001
2180 DATA 31,85,AA,A5,B1,86,B0,2A,718
2190 DATA 40,85,B1,A5,B0,40,0A,26,843,7635
2200 DATA B1,0A,26,B1,65,AA,90,02,319
2210 DATA E6,B1,85,B0,60,18,65,B0,1121
2220 DATA 85,B0,60,65,B1,85,B1,4C,1077
2230 DATA A2,C3,A5,B0,60,20,E5,C3,1250
2240 DATA D0,B9,4C,2F,C1,20,57,F1,1069
2250 DATA C9,0D,60,A9,00,2C,A9,01,593
2260 DATA 85,93,A9,00,85,B9,85,90,1044
2270 DATA A2,40,A0,02,20,F9,FD,A2,1084,8157
2280 DATA 01,40,B4,20,E5,C3,F0,33,1066
2290 DATA C9,20,F0,F7,C9,22,D0,D2,1371
2300 DATA CA,20,DD,C3,C9,22,F0,0C,1137
2310 DATA E0,10,F0,C6,9D,40,02,E6,113.
2320 DATA D7,E0,D0,C3,20,E8,C3,F0,1086
2330 DATA 12,20,6D,C3,C9,01,F0,04,800
2340 DATA C9,08,D0,AE,85,BA,20,E5,117.
2350 DATA C3,D0,31,E6,B9,A5,B8,C9,1372,9608
2360 DATA 15,F0,0E,A5,B4,C9,08,F0,1228
2370 DATA 15,20,17,F8,B6,13,20,AF,726
2380 DATA F5,20,BA,F7,0E,A2,01,20,969
2390 DATA 20,50,F5,4C,A1,C4,20,B8,942
2400 DATA F4,A5,90,29,BF,D0,5E,90,1231
2410 DATA 56,4C,2F,C1,A5,00,A0,AA,1036
2420 DATA C9,15,10,02,A6,A8,20,F3,1035
2430 DATA C4,C0,AA,F8,C6,A0,95,20,1331,8498
2440 DATA ED,34,20,E5,C3,F0,0C,20,1173
2450 DATA 6D,C3,C9,04,90,03,4C,2F,779
2460 DATA C1,35,19,20,5D,C3,20,ED,1100
2470 DATA F5,4C,21,C4,A9,00,8D,04,928
2480 DATA D4,3D,E8,D4,8D,12,D4,A9,1116
2490 DATA 04,3D,E8,02,A0,00,DD,09,686
2500 DATA 03,3D,E0,DD,A9,0E,8D,06,823
2510 DATA 02,20,ED,FD,20,A0,E5,A0,1089,7694
2520 DATA 2F,A2,04,D0,04,A0,33,A2,798
2530 DATA 07,4C,8C,C6,A0,56,02,49,803
2540 DATA 80,8D,56,02,30,04,A0,F0,809
2550 DATA D0,32,F0,F4,A2,04,4C,BC,1044
2560 DATA C6,20,DD,C3,A0,00,F0,08,1057
2570 DATA 20,21,C4,A0,02,20,DD,C3,1043
2580 DATA 2C,A0,02,20,6D,C3,E6,AA,942
2590 DATA 10,05,05,B1,20,6D,C3,99,820,7326
2600 DATA 19,00,A5,B1,99,1A,00,60,642
2610 DATA A9,2F,85,1B,85,1C,20,FB,1004
2620 DATA C3,F0,06,20,E4,C4,20,6E,1037
2630 DATA C2,A9,00,85,20,20,6F,CA,873
2640 DATA A9,0E,85,0E,20,A0,CC,D0,1062
2650 DATA 04,A2,01,D0,45,C9,00,F0,885
2660 DATA 04,C9,1A,D0,20,A4,A9,30,1060
2670 DATA 1C,A0,03,D1,19,D0,16,88,791,7358
2680 DATA 10,F9,40,A2,2D,20,45,C3,840
2690 DATA 60,A0,01,20,27,C2,D1,19,764
```

memory starting at dddd.

To demonstrate the use of this command, I will use it to move Dismon to some other area of memory. Dismon normally resides at $C000 to $CFFF. If we wish to place it at $6000, we would first copy the program down into the correct area using the Transfer command which is described later.

T C000 CFFF 6000

The last three pages — 3 x 256 bytes — of Dismon consists solely of data tables therefore you only need to relocate the first 13 pages of the memory into which it was translated.

N 6000 6D00 C000 CFFF 6C00

The above command searches through the first 13 pages of the new program looking for any references to the old program and changing them appropriately.

Another example will help clarify the normal use of this command. Assuming you have a program in memory $1000 to $13FF and you wish to insert an extra 16 bytes at $1300. This would require the last 255 bytes to be moved up in memory by 16 bytes. This could be accomplished by:

N 1000 13FF 1300 13FF 1310
T 1300 13FF 1310

The fact that it displays every reference that it intends to change means that you can use it to look for references to certain areas of memory. For example, to find any references to locations 0 and 1 would require the following; N ssss eeee 0000 0001 C000.

O — For safety reasons, whenever control is returned to Dismon or whenever a command is executed within it, Dismon automatically switches in the Kernal Rom and resets the Interrupt Vector to the normal interrupt routine. However, for some purposes, such as having interrupt driven music continuing while within Dismon, this might not be desirable so the command O allows you to switch the protection On and Off.

P — Process a program starting at address specified by program counter.

P ssss — Process a program at ssss. This command allows slow monitored running of a machine-code program. As each instruction is executed, the instruction is first shown on the screen along with the current state of all the various registers. It then waits for a key to be pressed or the shift key allowing fairly fast running.

This command as well as being a fairly good way to debug your routines is an ideal way for a beginner to examine what effect all the instructions have on the various registers, particularly the status register. You are also able to affect the operation of the program depending upon what keys you press. If it is displaying a branch instruction then by pressing R, you are able to reverse whether or not the branch is taken. This is useful for existing long delay loops etc.

When the process routines comes to a JSR instruction, there are several options. If the address of the subroutine is within the Kernal Rom ($E000-$FFFF) then the routine is executed immediately without processing unless you press the key to examine it in detail. If the address of the subroutine is not in the Kernal, then it assumes you wish to process each instruction of the routine unless you press D to do it immediately.

Since the constant displaying of the registers and disassembly slow the process command down as well as interfering with anything that the other program might be printing, it is possible to suppress the printing of them by pressing S. In this case it still waits for a keypress or the Shift key between each instruction but by a combination of suppressed output and Shift pressed very fast processing can be obtained although still 500 times slower than normal machine code speed. Pressing S again restarts displaying of the instructions etc.

Q ssss eeee ssss eeee dddd — This command is almost exactly the same as the N command with one difference. Normally the relocate routine displays all the invalid opcodes it finds. However, if you are using the routine purely to find references to some area of memory, then if there are large data tables scattered throughout your program it would take too long to display all the invalid bytes found so this routine only prints out the references found. Don't ask why Q!

R — This displays the current state of the Accumulator, X register, Y register, Stack Pointer, Program Counter, Status register, IRQ Vector and NMI Vector. The status register is also expanded out for easy reference of which flags are set. Any of the values can be altered using screen editing and the new values would be used next time a G, J or P command is used.

S "FILENAME" dd ssss eeee or S "FILENAME" dd ssss eeee bb — This command allows you to save a block of memory to either disc or tape. The end address of the block to be saved (eeee) must be specified as one byte past the last byte to be saved. The second variety of save command allows you to specify a different secondary

(continued on next page)

```
2700 DATA F0,F9,20,B0,CA,A6,1F,20,1030
2710 DATA 26,C6,A6,1F,20,D2,CC,20,919
2720 DATA 87,C5,A5,0E,F0,F9,A2,36,1070
2730 DATA 20,45,C3,A9,00,85,0E,8E,930
2740 DATA 6D,CE,20,10,C2,20,59,C3,873
2750 DATA 24,8E,10,F9,A5,A9,F0,01,1010,7500
2760 DATA 60,20,DA,C1,B0,0D,A6,CE,721
2770 DATA F0,F6,A9,00,85,A0,20,74,1104
2780 DATA C0,D0,07,20,74,C0,C9,53,1030
2790 DATA D0,14,A5,20,F0,F5,C6,20,1140
2800 DATA A2,03,68,95,19,CA,10,FA,911
2810 DATA 20,3F,C3,4C,10,C5,C9,46,863
2820 DATA D0,F9,A5,20,C9,10,F0,DE,1330
2830 DATA A6,1F,20,D2,CC,C9,0D,F0,1085,6384
2840 DATA D2,C0,02,70,CE,E6,20,AE,1277
2850 DATA 19,30,F9,5D,CE,85,19,80,979
2860 DATA 02,C6,1A,92,00,85,19,46,666
2870 DATA E8,E0,04,D0,F0,A9,FF,8E,1473
2880 DATA 18,85,1C,20,12,D0,09,AE,782
2890 DATA 1D,85,19,45,1E,85,1A,4C,617
2900 DATA A8,C5,A6,1F,A0,01,B1,19,925
2910 DATA 48,C8,B1,19,85,1A,68,85,878,7509
2920 DATA 19,BD,85,3E,C9,20,F0,E7,1257
2930 DATA C9,4C,F0,E3,C9,6C,D0,06,1267
2940 DATA A0,00,A2,12,B0,E0,20,D2,1014
2950 DATA CC,C9,03,F0,04,A9,00,85,954
2960 DATA 1A,20,08,C2,20,74,C0,C9,884
2970 DATA 46,F0,F6,4C,7A,C3,20,D2,1225
2980 DATA CC,B9,41,3E,48,B9,40,CE,1187
2990 DATA 18,6D,5C,C0,A8,69,68,5D,891,8599
3000 DATA C0,48,98,48,8C,1C,CF,A2,1073
3010 DATA 03,20,BC,C6,FC,87,C3,A9,750
3020 DATA 23,4C,A1,C6,20,9A,C6,A0,1014
3030 DATA 03,D0,5F,20,AB,C5,4C,B8,967
3040 DATA C6,20,AB,C6,4C,57,C6,A0,1120
3050 DATA 01,B1,19,3A,70,A4,C3,A2,840
3060 DATA 2D,20,45,C3,20,B4,CC,A2,925
3070 DATA 04,4C,22,C3,A9,00,2C,A9,691,7600
3080 DATA 02,48,A9,20,20,A1,C6,60,778
3090 DATA A0,A2,03,30,2F,A9,20,20,829
3100 DATA 5F,C3,20,A8,C6,A9,29,4C,977
3110 DATA 5F,C3,A9,5A,20,5F,C3,A9,1040
3120 DATA 20,20,5F,C3,A0,01,B1,19,717
3130 DATA 4C,29,C3,A0,02,B1,19,20,708
3140 DATA 29,C3,4C,A4,C6,20,96,C6,1056
3150 DATA A0,00,A2,02,E9,12,C1,20,764,6871
3160 DATA 5F,C3,C8,CA,10,F6,60,4C,1318
3170 DATA CA,C6,A5,C8,C5,AA,F0,2A,1417
3180 DATA 85,AA,C9,04,F0,13,C9,05,973
3190 DATA D0,20,A2,10,E4,D6,F0,06,1114
3200 DATA 20,FF,E9,CA,E0,F6,20,F0,1448
3210 DATA E9,A4,D3,A9,20,91,D1,C8,1363
3220 DATA C4,D5,90,F9,F0,F7,A9,00,1438
3230 DATA 85,CF,4C,40,E8,4C,0C,C7,998,10089
3240 DATA 48,8A,48,98,48,A2,00,4C,744
3250 DATA 32,C0,60,60,20,F5,C1,20,952
3260 DATA E5,C2,F0,03,20,E4,C4,E6,1353
3270 DATA A9,20,00,C2,24,08,30,09,627
3280 DATA 20,3E,C2,20,F5,C1,20,19,812
3290 DATA C5,20,F5,C1,20,A0,CC,D0,1271
3300 DATA 03,4C,7F,C0,C9,00,F0,F9,1088
3310 DATA 0A,A6,18,65,19,85,18,A5,781,7620
3320 DATA 1A,69,00,85,1C,D0,A2,04,594
3330 DATA 88,F8,C7,95,46,CA,10,F8,1324
3340 DATA B1,19,99,45,00,88,10,F8,824
3350 DATA 20,74,C0,A4,1F,BE,65,CE,1064
3360 DATA A0,C9,53,D0,06,A5,8B,49,1043
3370 DATA 80,85,8B,E0,4C,F0,3A,E8,1222
3380 DATA 4E,D0,04,A0,8D,EA,18,90,725
3390 DATA 3B,E0,6C,D0,0C,A0,E1,B1,951,7747
3400 DATA 46,99,18,00,88,F0,F8,D0,1082
3410 DATA 65,E0,20,D0,25,29,44,F0,1111
3420 DATA 60,A4,4C,C0,E0,70,04,07,1076
3430 DATA 45,D0,56,A5,18,30,02,C6,963
3440 DATA 1C,C6,18,A5,1C,48,F5,18,710
3450 DATA 48,A5,46,85,18,45,47,4C,779
3460 DATA EC,C7,F0,A0,D0,8F,A8,A9,1184
3470 DATA 00,05,18,68,69,00,85,1C,520,7455
3480 DATA 98,2C,8A,29,1F,C9,10,D0,823
3490 DATA 28,8A,2A,2A,2A,29,03,AA,518
3500 DATA A5,2A,B0,02,49,FF,C0,52,987
3510 DATA D0,02,49,FF,3D,3A,CE,F0,1135
3520 DATA 08,A4,46,20,BA,CC,F5,10,863
3530 DATA 05,18,A5,1E,85,1C,4C,05,598
3540 DATA C0,20,3A,C1,48,A5,27,29,799
3550 DATA 4C,45,00,EA,EA,4C,00,C3,889,6612
3560 DATA 20,C5,C1,20,69,C1,EA,85,1072
3570 DATA 2A,24,08,30,09,A9,91,20,616
3580 DATA 5F,C3,AA,20,47,C3,A5,18,950
3590 DATA 65,19,A5,1C,85,1A,4C,17,611
3600 DATA C7,20,6A,C3,85,1F,20,E8,960
3610 DATA C4,A6,00,20,A8,C0,A5,1F,1100
3620 DATA E0,19,F0,03,10,71,19,91,799
3630 DATA 19,20,E7,C2,D0,E0,20,33,800,[illegible]
3640 DATA C3,20,A0,C0,B1,19,D1,13,1030
3650 DATA F0,06,20,20,C3,20,53,C3,815
3660 DATA 20,21,C2,20,ED,F6,D0,E9,1215
3670 DATA A9,20,F0,C4,A0,A4,20,E3,969
3680 DATA C9,A6,00,E0,05,F0,D7,A5,1350
3690 DATA 19,38,E5,1D,A5,1A,E5,1E,789
3700 DATA B0,2D,20,D6,C1,A5,0F,18,992
3710 DATA 65,1D,85,1D,98,65,1E,85,788,7494
3720 DATA 1E,20,A0,C0,B1,18,91,13,811
3730 DATA AE,1D,D0,02,C6,1E,C6,1D,859
3740 DATA AE,18,D0,06,A5,1C,F0,1A,865
3750 DATA C6,1C,C6,18,4C,01,C6,20,868
3760 DATA A1,C0,B1,19,91,1D,20,21,812
3770 DATA C9,D0,F4,20,D4,C1,B0,05,1266
3780 DATA A6,60,4C,BF,C4,A0,00,60,927
3790 DATA A9,3F,20,41,C3,A2,00,86,820,7240
3800 DATA CC,E0,06,D4,20,3E,F1,F0,1257
3810 DATA FE,48,A4,D3,A5,CE,91,D1,1423
3820 DATA A9,00,85,CF,E6,CC,60,C9,1240
3830 DATA 03,D0,06,20,3F,C3,4C,20,615
3840 DATA C3,C9,14,D0,15,20,B6,C1,1004
3850 DATA F0,0D,20,32,C2,A0,00,93,841
3860 DATA 91,19,A9,14,20,5F,C3,4C,757
3870 DATA 80,C4,A0,00,91,19,20,5F,844,8171
3880 DATA C3,20,27,C2,D0,37,20,6F,994
3890 DATA CA,A9,91,4C,5F,C3,20,E5,1143
3900 DATA C3,D0,03,85,8B,60,A9,00,943
3910 DATA 85,20,C6,A9,A2,00,20,B3,947
3920 DATA C3,95,45,E8,E0,03,D0,F5,1326
3930 DATA A0,E2,A2,02,A9,00,E5,1E,882
3940 DATA B5,45,D9,11,CD,F0,02,E6,1161
3950 DATA 1E,88,CA,10,F3,A5,1E,F0,1062,8458
3960 DATA 30,C0,3A,B0,E5,A5,45,C9,1138
3970 DATA 20,D0,23,A5,47,20,70,C3,863
3980 DATA 85,1C,20,6D,C3,38,E5,17,807
3990 DATA 48,A5,1C,E5,1A,30,0F,68,847
4000 DATA A4,E0,86,1C,A9,80,E5,20,1026
4010 DATA 20,DD,C3,4C,1C,C9,4C,2F,876
4020 DATA C1,84,1D,20,E5,C3,F0,65,1151
4030 DATA C9,3A,F0,61,C9,2D,F0,53,1175,7883
4040 DATA C9,2C,D0,06,20,DD,C3,4C,970
4050 DATA 84,C9,C9,22,F0,F6,C9,21,1342
4060 DATA D0,0C,A4,D3,B1,D1,48,20,1085
4070 DATA E5,C3,68,4C,8A,C9,A2,20,1105
4080 DATA 84,1F,A3,07,D0,8C,CC,D0,1666
4090 DATA 09,A5,20,85,1F,85,20,4C,483
4100 DATA 73,C9,46,1F,CA,10,ED,20,964
4110 DATA 70,C3,A6,20,30,16,85,1C,726,7779
4120 DATA 85,18,A5,A9,A0,85,30,A4,770
4130 DATA A9,AA,30,A7,A5,B1,F0,A3,1294
4140 DATA 85,1C,D0,02,85,1B,8A,09,670
4150 DATA 48,05,20,30,96,A9,00,85,779
4160 DATA D4,A5,1D,A2,97,BD,1C,CF,1175
4170 DATA D6,40,20,D2,CC,C0,12,D0,1147
4180 DATA 23,A5,20,C9,C0,30,1D,A9,1031
4190 DATA 08,85,20,A5,18,E9,02,85,853,7577
4200 DATA 18,B0,02,C6,1C,20,D6,C1,870
4210 DATA AE,8F,10,01,C8,85,1C,98,838
4220 DATA D0,26,A0,12,A5,20,C0,10,829
4230 DATA D6,14,C9,00,D0,10,8D,85,1103
4240 DATA CE,A0,00,91,19,20,27,C2,881
4250 DATA CE,1C,D0,F7,F0,3A,D9,6C,1304
4260 DATA CE,F0,00,A5,1D,CA,D0,A8,1231
4270 DATA 4C,2F,C1,20,D2,CC,8D,85,1084,8062
4280 DATA CE,48,98,AA,68,40,00,97,1009
4290 DATA 19,C0,90,80,60,CE,F0,19,1169
4300 DATA 8E,6D,CE,C9,02,F0,05,A5,1117
4310 DATA 1E,91,19,C8,A5,1C,91,19,780
4320 DATA A9,91,20,5F,C3,20,19,C5,890
4330 DATA 4C,04,C9,A9,3A,80,0C,A7,807
4340 DATA 38,48,20,3F,C3,60,20,5F,655
4350 DATA C3,C9,3A,F0,03,20,59,C3,1013,7502
4360 DATA 2E,20,C3,4C,59,C3,20,D3,872
4370 DATA C3,20,9C,C3,20,3F,C3,A9,1030
4380 DATA 97,4C,22,C3,20,DD,C3,A9,1073
4390 DATA 00,85,19,85,1A,20,E5,C3,773
```

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address other than the default of zero. The secondary address has the same meaning as in Basic.

T ssss eeee dddd — Transfer a block of memory ssss-eeee to the memory at dddd onwards.

U b . . . — Unhex the one to four digit hex number into decimal.

V or V "NAME" or V "NAME" dd or V "NAME" dd ssss — Verify a program. Same options as Load.

W bb ssss eeee — Write a certain byte to the specified block of memory (Fill memory).

X — Exit back to Basic.

Up Arrow — This alternately switches a printer on and off line to allow you to output disassemblies and memory dumps to the printer instead of the screen. The routine assumes that the printer is device four and that the secondary address required is one.

However, if your printer does not conform to this, they can easily be changed by altering the LDX #04 instruction at $CCE6 to load the X register with the device number of your printer and altering the LDY #01 instruction at $CCF7 to load the secondary address required. For instance, if you use the 1520 printer/plotter then you would use LDX #06 and LDY #00.

As if the above commands are not enough, it is possible to add your own very simply. This is because, whenever Dismon does not recognise a particular command character, it searches through memory from $0800 to $CF00 looking for a sequence of four machine code instructions at the start of every page. If it finds them it then JSR's to that page with the accumulator containing the Ascii of the command character.

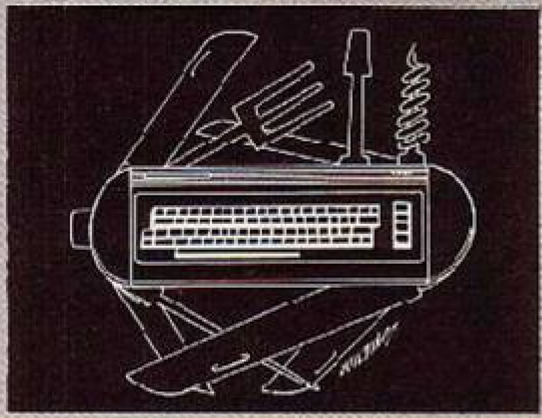
Therefore all that is required within your subroutine is to check if it is the correct command and if not, to Return at which point Dismon continues looking through memory for any other routines and if none are found, gives an error. For instance, if you wish to add the '+' command to give the function of clearing the screen it would be done as follows:

```
A 1C00             :Start at some
                    page boundary
> 1C00 SED         :This is the
                    sequence of
                    four
                    instructions
                    that
> 1C01 CLD         :Dismon uses to
                    recognise an
                    added command
> 1C02 SEC
> 1C03 CLC
> 1C04 CMP#'+      :Was the correct
                    character used
> 1C06 BEQ 01      :Branch if correct
> 1C08 RTS         :Not this
                    subroutine so try
                    another
> 1C09 PLA         :Remove the Error
                    return address
                    from the stack
> 1C0A PLA         :And the hi byte
> 1C0B LDA #93     :Now your CLS
                    routine
> 1C0D JSR FFD2    :Print clear screen
                    char
> 1C10 RTS         :Return to Dismon
                    to execute next
                    command
```

If, within your extra command, you require to read in any parameters from the remainder of the line, then this would be done by repeated JSR's to a subroutine at $FFCF. Each JSR would return, in the accumulator, the ASCII value of the next character on the line, with a $0D indicating the fianl carriage return.

A couple of final points of interest to the experienced programmer are that Dismon is totally independent of the Basic Rom therefore the Rom can happily be switched out while within Dismon although don't try exiting from Dismon while it is out. Dismon makes quite extensive use of zero page locations for all its commands so the following locations should not be used by your programs; $19-$20, $26-$2A, $45-$4A, $8B-$8F, $A8-$AA, $B0-$B1 and $0240-$0256.

If you don't relish the task of typing in the 4K hexdump then I will supply a cassette copy of the program along with an example of the extra commands in the form of a disc command routine giving you all the normal disc commands including cataloguing for just £3. Write to John Twiddy, 65 Holly Avenue, Wallsend, Tyne & Wear. NE28 6PB. ■



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```
4400 DATA F0,13,20,8A,C3,A2,04,06,796
4410 DATA 19,26,1A,CA,10,F7,05,19,778
4420 DATA 85,19,4C,9D,CA,20,3F,C3,883
4430 DATA A5,01,48,09,07,85,01,A6,554,6759
4440 DATA 19,A5,1A,20,CD,BD,68,85,879
4450 DATA 01,60,C9,2A,F0,0E,C9,27,834
4460 DATA F0,05,20,70,C3,18,60,20,736
4470 DATA 0D,C3,18,60,20,DD,C3,C9,1185
4480 DATA 2A,D0,2A,30,20,E5,C4,A0,1008
4490 DATA 00,8C,40,02,8C,43,02,04,552
4500 DATA 8C,20,E5,C3,F0,35,20,DD,1145
4510 DATA C3,C9,2D,F0,13,22,C4,CA,1136,7475
4520 DATA 99,41,02,F4,8C,C9,2F,40,900
4530 DATA 02,C0,08,90,E4,43,2F,C1,890
4540 DATA 84,1F,A0,00,20,DD,C3,20,803
4550 DATA DD,C3,20,CA,CA,99,49,02,1080
4560 DATA 2E,48,02,C0,C4,1F,D0,EC,99
4570 DATA A5,8C,09,80,85,8C,20,5D,840
4580 DATA C3,A5,8C,29,07,F3,2A,A8,998
4590 DATA 80,84,20,A9,01,85,1F,AD,807,7309
4600 DATA 40,02,25,1F,D0,07,81,19,55
4610 DATA 09,41,02,30,07,05,1F,08,677
4620 DATA 10,ED,30,0E,20,ED,F6,F0,1070
4630 DATA 08,20,27,C2,20,D5,C1,B0,808
4640 DATA D0,60,20,20,C3,20,53,C3,873
4650 DATA 29,8C,10,E0,A9,01,85,1F,750
4660 DATA A4,20,AD,40,02,25,1F,D0,719
4670 DATA 05,89,49,02,91,17,06,1F,472,6003
4680 DATA 06,10,EF,30,CF,20,E0,C4,1106
4690 DATA A0,30,20,ED,C4,03,08,C0,1137
4700 DATA 2C,B0,F7,A5,45,38,E5,49,1059
4710 DATA 85,45,A5,46,E5,4A,03,46,943
4720 DATA E6,A9,20,48,C0,20,A0,CC,1190
4730 DATA B0,15,AD,08,C7,10,F0,05,995
4740 DATA 20,27,C2,30,56,20,68,CA,900
4750 DATA A2,01,20,10,C2,F2,4C,04,853,8191
4760 DATA 20,E0,01,F0,4B,C0,02,F0,1086
4770 DATA 47,A0,01,31,17,08,18,C0,774
4780 DATA 81,19,85,1E,A4,20,E0,03,788
4790 DATA F0,04,A9,00,85,1E,C0,12,786
4800 DATA F0,43,20,70,CC,90,29,A5,1013
4810 DATA 1D,18,65,35,85,1D,A5,1E,940
4820 DATA 65,46,F0,07,E0,03,F0,03,888
4830 DATA 4C,08,CC,A0,02,E0,03,D0,1016,2073
4840 DATA 02,91,19,88,45,1D,97,19,672
4850 DATA 20,19,C5,20,74,C8,D0,0A,812
4860 DATA 8A,10,65,19,85,19,90,02,592
4870 DATA E6,1A,20,ED,F6,D0,03,4C,1050
4880 DATA D8,C0,4C,42,C8,A4,13,A2,1215
4890 DATA 04,20,EC,C1,A2,02,20,78,781
4900 DATA CC,08,20,8A,CC,20,78,CC,998
4910 DATA 80,05,20,80,17,98,02,20,813,6533
4920 DATA B0,CE,A6,16,90,10,07,CA,909
4930 DATA 18,65,45,18,01,E0,90,01,580
4940 DATA E8,4C,67,C2,A9,00,38,E5,1049
4950 DATA 46,AA,98,10,01,CA,38,E5,896
4960 DATA 45,10,01,E8,80,01,CA,E0,921
4970 DATA 00,D0,20,A0,01,91,19,20,603
4980 DATA 19,C5,20,79,C0,9C,1A,CC,860
4990 DATA A5,1D,C5,49,A5,1E,E5,4A,962,6196
5000 DATA 90,08,A5,17,C5,1D,A5,4E,851
5010 DATA E5,1E,60,20,19,C5,20,C5,830
5020 DATA C4,20,55,35,20,58,C5,A9,900
5030 DATA 5E,AA,20,47,C3,4C,47,C3,904
5040 DATA A0,00,81,19,A2,97,86,1F,840
5050 DATA D0,85,CE,70,04,CA,D0,F6,1460
5060 DATA A0,10,30,D2,CC,AA,A0,E0,1112
5070 DATA 00,60,38,78,65,19,85,1C,592,7585
5080 DATA A5,1A,69,00,85,1E,E6,11,710
5090 DATA D0,02,E6,1E,98,10,07,C6,838
5100 DATA 1E,60,0A,4A,A8,B9,04,CF,1070
5110 DATA 90,04,4A,4A,4A,4A,29,0F,500
5120 DATA 0A,A8,B9,6D,CE,40,A2,04,940
5130 DATA E4,9A,D0,08,20,5D,C3,2E,953
5140 DATA 33,F3,A9,04,4C,51,F2,A0,1070
5150 DATA 01,A9,04,20,00,FE,A9,0E,629,6746
5160 DATA 20,F9,FD,20,4A,F3,B0,E4,1237
5170 DATA A2,04,4C,50,F2,3A,3E,41,749
5180 DATA 38,5E,2C,50,29,2C,59,0D,472
5190 DATA 20,20,50,43,20,20,49,52,430
5200 DATA 51,56,20,4E,4D,49,56,20,545
5210 DATA 53,50,20,41,43,20,50,52,527
5220 DATA 20,59,52,20,53,52,20,4E,513
5230 DATA 56,20,42,44,49,CA,43,0D,585,3830
5240 DATA 38,0D,2E,4F,48,0D,2E,45,403
5250 DATA 52,52,4F,52,41,44,43,41,593
5260 DATA 4E,44,41,53,4C,42,43,45,573
5270 DATA 42,43,52,42,45,51,42,47,571
5280 DATA 54,42,4D,49,42,4E,45,42,579
5290 DATA 50,4C,42,52,48,42,56,43,593
5300 DATA 42,56,53,43,4C,43,43,4C,583
5310 DATA 44,43,4C,49,43,4C,56,43,584,4476
5320 DATA 4D,50,43,50,58,43,50,59,623
5330 DATA 44,45,43,44,45,58,44,45,565
5340 DATA 59,45,4F,52,49,4E,43,49,610
5350 DATA 4F,58,49,4E,59,4A,4D,50,637
5360 DATA 4A,53,52,4C,44,41,43,44,592
5370 DATA 58,4C,44,59,4C,53,52,4E,640
5380 DATA 4F,50,4F,52,41,50,48,41,602
5390 DATA 50,48,50,50,4C,41,50,4C,609,4884
5400 DATA 50,52,4F,4C,52,4F,52,53,642
5410 DATA 54,49,52,54,53,53,42,43,622
5420 DATA 53,45,43,53,45,44,53,45,591
5430 DATA 49,53,54,41,53,54,58,53,643
5440 DATA 54,59,54,41,58,54,41,59,648
5450 DATA 54,59,41,54,38,41,54,53,642
5460 DATA 58,54,58,53,8D,28,43,29,584
5470 DATA 20,4A,2E,54,37,49,44,44,532,4824
5480 DATA 59,0D,0D,4F,1E,20,0D,4F,396
5490 DATA 46,46,A3,02,0D,00,D5,00,1011
5500 DATA 84,02,B5,0C,20,00,D7,04,594
5510 DATA 87,00,83,0A,20,02,55,0A,749
5520 DATA F0,07,E4,02,58,04,84,03,777
5530 DATA 45,02,54,08,78,04,D9,06,676
5540 DATA 54,09,0A,02,31,03,20,09,351
5550 DATA 62,0A,8D,03,F0,07,88,02,737,5291
5560 DATA 95,06,1E,06,57,06,04,06,440
5570 DATA 23,06,7A,06,2A,06,30,06,271
5580 DATA 95,06,36,06,18,06,4E,06,360
5590 DATA 5C,06,00,40,01,02,30,24,361
5600 DATA 2A,5A,3F,2C,29,28,59,58,457
5610 DATA 22,F8,D0,38,00,01,A0,02,710
5620 DATA 80,02,91,02,39,02,C0,03,611
5630 DATA D1,03,C9,03,00,01,00,02,547,3825
5640 DATA 97,02,8F,02,D6,03,00,01,500
5650 DATA 05,06,08,09,0A,0D,0E,10,81
5660 DATA 11,15,16,18,19,1D,1E,20,280
5670 DATA 21,24,25,26,28,29,2A,2C,311
5680 DATA 2D,2E,30,31,38,3A,3D,39,400
5690 DATA 3D,3E,40,41,45,46,48,49,526
5700 DATA 4A,4C,4D,4E,50,51,55,56,627
5710 DATA 58,59,5D,5E,60,61,65,66,760,3133
5720 DATA 68,69,6A,6C,6D,6E,70,71,847
5730 DATA 75,76,78,79,7D,7E,81,84,968
5740 DATA 85,86,88,8A,8C,8D,8E,90,1108
5750 DATA 91,94,95,96,98,99,9A,9D,1208
5760 DATA A0,A1,A2,A4,A5,A6,A8,A9,1315
5770 DATA AA,AC,AD,AE,B0,B1,B4,B5,1403
5780 DATA B6,B8,B9,BA,BC,BD,BE,C0,1496
5790 DATA C1,C4,C5,C6,C8,C9,CA,CC,1591,9976
5800 DATA C8,CE,D0,D1,D5,D6,18,D9,1600
5810 DATA D8,DE,E0,E1,E4,E5,E6,E8,1811
5820 DATA E9,EA,EC,ED,EE,F0,F1,F5,1904
5830 DATA F6,F8,F9,FD,FE,58,A0,A8,1658
5840 DATA 40,A6,A0,40,A0,40,55,A8,923
5850 DATA A0,40,61,A0,A0,40,EE,33,980
5860 DATA 4C,3D,AF,AC,3D,AF,4C,30,857
5870 DATA AF,4F,3D,3D,AF,3E,3D,33,863,10612
5880 DATA AF,B5,7F,7F,9A,A3,7F,94,1200
5890 DATA 88,7F,9A,58,7F,7F,9A,67,1022
5900 DATA 7F,7F,9A,88,3A,3A,B2,AF,1055
5910 DATA 3A,B2,88,3A,B2,5E,3A,33,821
5920 DATA B2,C4,3A,3A,B2,C7,CD,C7,1271
5930 DATA CA,7C,B9,CD,C7,3A,43,C7,1415
5940 DATA CD,C7,CA,D6,C7,3F,C7,97,1592
5950 DATA 91,94,97,91,94,33,91,D8,1301,9685
5960 DATA 97,91,94,46,91,97,91,94,1103
5970 DATA A6,91,DC,97,91,24,73,AD,1139
5980 DATA 73,6D,76,80,6D,79,73,6D,932
5990 DATA 76,52,6D,6D,76,54,6D,6D,854
6000 DATA 76,78,B8,78,B8,32,85,B8,1066
6010 DATA 93,70,B8,02,49,B8,B8,02,1063
6020 DATA C1,B8,B8,02,B0,2A,02,01,998
6030 DATA 55,89,33,78,66,A5,22,02,872,8227
6040 DATA 01,55,95,38,03,57,86,2A,704
6050 DATA 02,01,55,95,38,83,67,85,792
6060 DATA 2A,02,01,5C,95,38,83,67,787
6070 DATA A6,22,02,58,55,89,33,84,871
6080 DATA 87,16,1A,22,02,81,55,95,710
6090 DATA 33,43,78,60,76,41,22,02,793
6100 DATA 01,55,95,38,03,87,16,2A,720
6110 DATA 22,18,58,55,89,33,78,66,609,5986
6120 DATA END, 470381
```

```
10REM==================================
20REM  T.C. BASIC
30REM  RTS GENERATOR
40REM   (c) D.J. Pilling
50REM  January 1985
60REM==================================
70
80REM enter the usual value of page
90REM for your system in line 110
100
110page=&E00
120
130PROCSETUP
140PROCASSEMBLE
150PROCJUMPTAB
160PROCFINISH
170END
180
190DEFPROCASSEMBLE
200FOR PASS=0 TO 3 STEP 3
210P%=FT
220[OPT PASS
230
240.START
250 PLA:STA RL:PLA:STA RH
260 TSX:STX SP
270 LDY#0:LDA (PL),Y:STA R1L
280 INY:LDA (PL),Y:STA R1H
290 INY:LDA (PL),Y:STA FVL
300 INY:LDA (PL),Y:STA FVH
310 LDY#2:STY FP
320.SVS LDA#0:STA (R1L),Y
330 LDA FVH:CMP R1H:BNE SV1
340 LDA FVL:CMP R1L:BEQ SVX
350.SV1 INCR1L:BNE SVS:INCR1H:BNE SVS
360.SVX LDA#4
370
380.ER
390 CLC:ADC PL:STA PL:BCC SF
400 INC PH:BNE SF
410.SX INC PL:BNE SF:INC PH
420.SF LDY#0:LDA (PL),Y:TAX
430 LDA JT,X:STA JTL:INX
440 LDA JT,X:STA JTH
450 JMP(JTL)
460
470.FVL BRK:.FVH BRK
480
490.add
500 PLA:STA R1L:PLA:STA R1H
510 PLA:CLC:ADC R1L:TAY
520 PLA:ADC R1H:PHA:TYA:PHA
530 JMP SX
540
550.sub
560 PLA:STA R1L:PLA:STA R1H
570 PLA:SEC:SBC R1L:TAY
580 PLA:SBC R1H:PHA:TYA:PHA
590 JMP SX
600
610.mul
620 LDA#0:STA SG
630 PLA:STA R1L:PLA:STA R1H
640 BPL M2
650 LDA#0:SEC:SBC R1L:STA R1L
660 LDA#0:SBC R1H:STA R1H
670 LDA#1:STA SG
680.M2 PLA:STA R2L:PLA:STA R2H
690 BPL M3
700 LDA#0:SEC:SBC R2L:STA R2L
710 LDA#0:SBC R2H:STA R2H
720 LDA#1:EOR SG:STA SG
730.M3 LDA#0:STA R3L:STA R3H
740 LDX#16:LDA R1H:BEQ ML
750 LDY R2H:STA R2H:STY R1H
760 LDA R1L:LDY R2L:STA R2L:STY R1L
770.ML CLC:ROR R2H:ROR R2L
780 BCS MA
790.MC CLC:ROL R1L:ROL R1H
800 DEX:BNE ML
810 LDA SG:BEQ MX
820 LDA#0:SEC:SBC R3L:TAX
830 LDA#0:SBC R3H:PHA:TXA:PHA
840 JMP SX
850.MX LDA R3H:PHA:LDA R3L:PHA
860 JMP SX
870.MA LDA R1L:CLC:ADC R3L:STA R3L
880 LDA R1H:ADC R3H:STA R3H
890 JMP MC
900
910.div
920 LDA#0:STA SG
930 PLA:STA R3L:PLA:STA R3H:TAX
940 ORA R3L:BNE DK
950 LDA#8B:JMP EXIT
960.DK TXA:BPL D2
970 LDA#0:SEC:SBC R3L:STA R3L
980 LDA#0:SBC R3H:STA R3H
990 LDA#1:STA SG
1000.D2 PLA:STA R2L:PLA:STA R2H
1010 BPL D3
1020 LDA#0:SEC:SBC R2L:STA R2L
1030 LDA#0:SBC R2H:STA R2H
1040 LDA#1:EOR SG:STA SG
1050.D3 JSR DM
1060 LDA SG:BEQ DX
1070 LDA#0:SEC:SBC R2L:TAX
1080 LDA#0:SBC R2H:PHA:TXA:PHA
1090 JMP SX
1100.DX LDA R2H:PHA:LDA R2L:PHA
1110 JMP SX
1120.DM
1130 LDA#0:STA R1L:STA R1H
1140 LDX#16:CLC
1150.DL
1160 ROL R2L:ROL R2H
1170 ROL R1L:ROL R1H
1180 LDA R3H:CMP R1H:BEQ DO
1190 BCS D0:BCC D1
1200.DO LDA R3L:CMP R1L:BEQ D1
1210 BCS D0:BCC D1
1220.D0 CLC:BCC DN
1230.D1
1240 LDA R1L:SEC:SBC R3L:STA R1L
1250 LDA R1H:SBC R3H:STA R1H:SEC
1260.DN DEX:BNE DL
1270 ROL R2L:ROL R2H:RTS
1280
1290.mod
1300 LDA#0:STA SG
1310 PLA:STA R3L:PLA:STA R3H:TAX
1320 ORA R3L:BNE OK
1330 LDA#80:JMP EXIT
1340.OK TXA:BPL O2
1350 LDA#0:SEC:SBC R3L:STA R3L
1360 LDA#0:SBC R3H:STA R3H
1370.O2 PLA:STA R2L:PLA:STA R2H
1380 BPL O3
1390 LDA#0:SEC:SBC R2L:STA R2L
1400 LDA#0:SBC R2H:STA R2H
1410 LDA#1:STA SG
1420.O3 JSR DM
1430 LDA SG:BEQ OX
1440 LDA#0:SEC:SBC R1L:TAX
1450 LDA#0:SBC R1H:PHA:TXA:PHA
1460 JMP SX
1470.OX LDA R1H:PHA:LDA R1L:PHA
1480 JMP SX
1490
1500.gtt
1510 PLA:STA R1L:PLA:STA R1H
1520 PLA:STA R2L:PLA:STA R2H
1530 JSR CP
1540 BEQ CF:BMI CF:BNE CT
1550
1560.ltt
1570 PLA:STA R1L:PLA:STA R1H
1580 PLA:STA R2L:PLA:STA R2H
1590 JSR CP
1600 BEQ CF:BPL CF:BNE CT
1610
1620.geq
1630 PLA:STA R1L:PLA:STA R1H
1640 PLA:STA R2L:PLA:STA R2H
1650 JSR CP
1660 BMI CF:BPL CT
1670
1680.leq
1690 PLA:STA R1L:PLA:STA R1H
1700 PLA:STA R2L:PLA:STA R2H
1710 JSR CP
1720 BPL CL:BEQ CF:BNE CT
1730.CL BNE CF:BEQ CT
1740
1750.equ
1760 PLA:STA R1L:PLA:STA R1H
1770 PLA:STA R2L:PLA:STA R2H
1780 JSR CP
1790 BMI CF:BNE CF:BEQ CT
1800
1810.neq
1820 PLA:STA R1L:PLA:STA R1H
1830 PLA:STA R2L:PLA:STA R2H
1840 JSR CP
1850 BEQ CF:BNE CT
1860
1870.CT LDA#&FF:PHA:PHA:JMP SX
1880.CF LDA#&00:PHA:PHA:JMP SX
1890.CP LDA R2L:CMP R1L:BEQ CQ
1900 LDA R2H:SBC R1H:ORA #1
1910 BVS CO:RTS
1920.CQ LDA R2H:SBC R1H:BVS CO:RTS
1930.CO EOR #&80:ORA #1:RTS
1940
1950.neg
1960 PLA:STA R1L:PLA:STA R1H
1970 LDA#0:SEC:SBC R1L:TAY
1980 LDA#0:SBC R1H:PHA:TYA:PHA
1990 JMP SX
2000
2010.vdu
2020 PLA:JSR OSWRITE:PLA
2030 JMP SX
2040
2050.ink
2060 PLA:TAX:PLA:TAY
2070 LDA#&81:JSR OSBYTE
2080 TYA:CMP#&FF:BEQ IT
2090 CMP#&1B:BEQ IE
2100.IR TYA:PHA:TXA:PHA
2110 JMP SX
2120.IE LDA#&7E:JSR OSBYTE
2130 LDX#0:LDY#0:JMP IR
2140.IT LDX#&FF:JMP IR
2150
2160.rts
2170 PLA:STA PL:PLA:STA PH
2180 JMP SF
2190
2200.ldi
2210 PLA:STA R1L:PLA:STA R1H
2220 LDA#0:PHA
2230 LDY#0:LDA (R1L),Y:PHA
2240 JMP SX
2250
2260.sti
2270 PLA:TAY:PLA:TAX
2280 PLA:STA R1L:PLA:STA R1H
2290 TYA:LDY#0:STA (R1L),Y
2300 LDA#0:LDY#1:STA (R1L),Y
2310 JMP SX
2320
2330.end
2340 LDA#44:JMP EXIT
2350
2360.pri
```

COM

In this article, the TC Basic run time system generator — RTSG — will be described. This program generates the TC Basic run time system — RTS; the purpose of this, is to provide the facilities and functions required by TC Basic programs. In addition, the RTS must also interpret the p-code programs.

The RTS consists of a small Basic program followed by a substantial amount of machine code. To construct it, type in the listing of the RTSG in figure 1. Before doing this, type in

```
2370 PLA:STA R1L:STA R2L
2380 PLA:STA R1H:STA R2H
2390 BPL FB
2400 LDA #0:SEC
2410 SBC R1L:STA R1L:STA R2L
2420 LDA #0
2430 SBC R1H:STA R1H:STA R2H
2440 LDA #ASC"-":JSR OSWRITE
2450.FB
2460 LDA#0:STA SG
2470 LDA # 10000 MOD256:STA R3L
2480 LDA # 10000 DIV256:STA R3H
2490 JSR PS
2500 LDA # 1000 MOD256:STA R3L
2510 LDA # 1000 DIV256:STA R3H
2520 JSR PS
2530 LDA #100:STA R3L
2540 LDA #0:STA R3H
2550 JSR PS
2560 LDA #10:STA R3L
2570 JSR PS
2580 LDA #1:STA R3L:STA SG
2590 JSR PS
2600 JMP SX
2610.PS LDX#0
2620.PP LDA R1L:SEC:SBC R3L:STA R1L
2630 LDA R1H:SBC R3H:STA R1H
2640 BMI PE
2650 STA R2H:LDA R1L:STA R2L
2660 INX:JMP PP
2670.PE LDA R2L:STA R1L
2680 LDA R2H:STA R1H
2690 TXA:BNE PR:LDA SG:BEQ PX
2700.PR TXA:CLC:ADC #ASC"0"
```

D J Piling continues his compiler for the BBC. If you're speed crazy this program is for you.

PILER

PAGE = PAGE + 5120

This is necessary because the RTS is constructed at the usual value of PAGE for your system. In fact, the value of PAGE used by your computer, must be entered in line 110. For a Tape based system, this will be &E00 and for a disc system &1900. The RTS is therefore constructed underneath the RTSG in memory.

When you have typed in all of the program, Save it and then go through the usual debugging process. When Run, the RTSG will produce an assembly language listing, this will be followed by a statement of the value of the address of the top of the RTS. Note this number down. Next reset Page to its usual value and type End followed by Run. If everything is OK you will be greeted by the RTS menu.

Three functions are performed by the RTS and can be selected by pressing the number keys 1, 2 or 3. These are to load a code file produced by the compiler into the RTS and form, a free standing module. Second, execute any such module and, thirdly, Save any such module. Initially, you must select option 3. This will allow you to Save your copy of the RTS.

Now reload the compiler into your computer and enter in line 120 the value for the top of the RTS which the RTSG provided you with. The compiler is now complete and can be Saved.

In the last article, it was described how to compile a program. After following this prescription, you will be left with a file whose name starts with C. and which contains the p-code version of your program. The next thing to do, is to Load the RTS and Run it. Now select option 1 and type in the name of the code file when prompted.

This will be Loaded and a module formed which can be Saved with option 3. In the future whenever you want to execute the compiled version of your program, the module can be Loaded and Run and option 2 — execute code — selected. The module will be saved with a file name prefixed by M.

The RTS can be Escaped from and reRun. In addition, if your p-code program gets into an endless loop; Break plus Old will also work.

The TC Basic system, is thus now complete. Some points about its use should be noted. First, there is a limitation on the use of delimiters like Next and Endproc not present in BBC Basic; this is that for each Defproc there can be only one Endproc and for each FOR there can be only one Next. Thus statements like: IF A = 2 Endproc; will not compile.

This is done to protect the programmer; returning from a non-existent subroutine, would have disastrous results. Similar restrictions apply to functions and Repeat Until loops. Secondly, if a Def statement is encountered in the path of execution, it will be treated as an End statement.

The RTS implements code to deal with run time errors: attempts to divide by zero, to take square roots of negative numbers or dimension arrays twice will gracefully terminate execution with an error message and return control to the Basic section of the RTS.

As you can see from the listing of the RTSG the final few lines — lines 6970 to 7270 — are in fact the Basic section of the RTS; procedure Proccopy — lines 6750 to 6830 — is used to copy this Basic down to the usual value of Page. The two Stops in line 6960 are used as a tag for this copying process and must be typed exactly as shown. This piece of the program is just used to handle the RTS menu and the three functions that can be selected: i.e. loading, saving and executing the mc.

Interpret p-code

The machine code part of the RTS has to be able to interpret p-code; it does this by using the opcode number — you may have noticed from the code generation procedures in the compiler that all opcodes are multiples of two — as an index to select the start address of a routine from a jump table. An indirect jump to this address then results in the required function being performed.

Thus most of the assembly language consists of a large number of routines — each represents one opcode. In the listing they can be clearly seen by being split up by blank lines; in addition, each one starts with a label in lower case letters which corresponds to the names of the code generating procedure in the compiler.

Finally, the value of the top of the RTS is printed out so that it can be inserted in the compiler. For a system with a Page value of &E00 this number will be 7040 while, for a system with a Page value of &1900, it will be 9856.

A C30 containing the listings from both articles, TC Basic systems set up for both tape and disc based computers and example programs and code files is available from D J Pilling, 12 Cherrywood Avenue, Anchorsholme, Blackpool FY5 1SU in return for £2.99.

```
2710 JSR OSWRITE
2720 LDA#1:STA SG
2730.PX RTS
2740
2750.dup
2760 PLA:TAY:PLA:TAX
2770 PHA:TYA:PHA:TXA:PHA:TYA:PHA
2780 JMP SX
2790
2800.swp
2810 PLA:TAY:PLA:TAX
2820 PLA:STA R1L:PLA:STA R1H
2830 TXA:PHA:TYA:PHA
2840 LDA R1H:PHA:LDA R1L:PHA
2850 JMP SX
2860
2870.drp
2880 PLA:PLA:JMP SX
2890
2900.vdd
2910 PLA:JSR OSWRITE
2920 PLA:JSR OSWRITE
2930 JMP SX
2940
2950.vdl
2960 LDY#1:LDA (PL),Y
2970 JSR OSWRITE
2980 LDA#2:JMP SR
2990
3000.snd
3010 LDX# R1L:LDY #0
3020 PLA:STA R4L:PLA:STA R4H
3030 PLA:STA R3L:PLA:STA R3H
3040 PLA:STA R2L:PLA:STA R2H
3050 PLA:STA R1L:PLA:STA R1H
3060 LDA#7:JSR OSWORD:JMP SX
3070
3080.ldt
3090 LDX# R1L:LDY #0
3100 LDA#1:JSR OSWORD
3110 LDA R1H:PHA:LDA R1L:PHA
3120 JMP SX
3130
3140.stt
3150 LDX# R1L:LDY #0
3160 PLA:STA R1L:PLA:STA R1H
3170 LDA#0:STA R2L:STA R2H:STA R3L
3180 LDA#2:JSR OSWORD:JMP SX
3190
3200.and
3210 PLA:STA R1L:PLA:STA R1H
3220 PLA:TAX:PLA:AND R1H:PHA
3230 TXA:AND R1L:PHA:JMP SX
3240
3250.ora
3260 PLA:STA R1L:PLA:STA R1H
3270 PLA:TAX:PLA:ORA R1H:PHA
3280 TXA:ORA R1L:PHA:JMP SX
3290
3300.eor
3310 PLA:STA R1L:PLA:STA R1H
3320 PLA:TAX:PLA:EOR R1H:PHA
3330 TXA:EOR R1L:PHA:JMP SX
3340 .R1 RTS:.R2 RTS
3350
3360.rnd
3370 PLA:STA R3L:PLA:STA R3H
3380 BMI RX:ORA R3L:CMP#2:BCC RX
3390 LDY#14
3400.RLO LDA R2:AND#96:STA R1L
3410 ROL A
3420 EOR R1L:ROL A:ROL A
3430 ROL R1:ROL R2
3440 DEY:BNE RLO
3450 LDA R2:AND#127:STA R2H
3460 LDA R1:STA R2L:JSR DH
3470 LDA#1:CLC:ADC R1L:TAY:LDA#0
3480 ADC R1H:PHA:TYA:PHA:JMP SX
3490.RX LDA#1:STA R1:STA R2
3500 LDA#0:PHA:LDA#1:PHA:JMP SX
3510
3520.jsr
3530 LDA PL:CLC:ADC#3:TAY
3540 LDA PH:ADC#0
3550 PHA:TYA:PHA
3560
3570.jmp
3580 LDY#1:LDA (PL),Y:TAX
3590 LDY#2:LDA (PL),Y:STA PH
3600 TXA:STA PL
3610 JMP SR
3620
3630.jmc
3640 PLA:BNE C1
3650 PLA:BNE C2
3660 BEQ jmp
3670.C1 PLA
3680.C2 LDA#3:JMP SR
3690
3700.lda
```

(continued on next page)

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```
3710 LDY#1:LDA (PL),Y:STA R1L
3720 LDY#2:LDA (PL),Y:STA R1H
3730 LDY#1:LDA (R1L),Y:PHA
3740 LDY#0:LDA (R1L),Y:PHA
3750 LDA#3:JMP SR
3760
3770.sta
3780 LDY#1:LDA (PL),Y:STA R1L
3790 LDY#2:LDA (PL),Y:STA R1H
3800 LDY#0:PLA:STA (R1L),Y
3810 LDY#1:PLA:STA (R1L),Y
3820 LDA#3:JMP SF
3830
3840.ldi
3850 LDY#2:LDA (PL),Y:PHA
3860 LDY#1:LDA (PL),Y:PHA
3870 LDA#3:JMP SR
3880
3890.for
3900 LDX FP:LDY#7
3910.FXL LDA FAL,Y:STA&500,X
3920 INX:DEY:BPL FXL:STX FP
3930 LDY#1:LDA (PL),Y:STA FAL
3940 INY:LDA (PL),Y:STA FAH
3950 PLA:STA FSL:PLA:STA FSH
3960 PLA:STA FLL:PLA:STA FLH
3970 LDA#3:CLC:ADC PL:STA PL:STA FJL
3980 LDA#0:ADC PH:STA PH:STA FJH
3990 JMP SF
4000
4010.ldn
4020 JSR GTA:LDY#1:LDA (R3L),Y:PHA
4030 DEY:LDA (R3L),Y:PHA:LDA#3:JMP SR
4040
4050.stn
4060 PLA:STA R6L:PLA:STA R6H:JSR GTA
4070 LDY#1:LDA R6H:STA (R3L),Y
4080 DEY:LDA R6L:STA (R3L),Y
4090 LDA#3:JMP SR
4100
4110.dmn
4120 LDY#1:LDA (PL),Y:STA R1L
4130 INY:LDA (PL),Y:STA R1H
4140 DEY:LDA FVH:STA (R1L),Y
4150 DEY:LDA FVL:STA (R1L),Y
4160 PLA:CLC:ADC FVL:STA FVL
4170 PLA:ADC FVH:STA FVH
4180 LDA#3:JMP SR
4190
4200.dma
4210 LDY#1:LDA (PL),Y:STA R1L
4220 INY:LDA (PL),Y:STA R1H
4230 DEY:LDA (R1L),Y:DEY:ORA (R1L),Y
4240 BEQ DMY:LDA#33:JMP EXIT:.DMY
4250 INY:LDA FVH:STA (R1L),Y:STA R5H
4260 DEY:LDA FVL:STA (R1L),Y:STA R5L
4270 PLA:STA R4L:STA (R5L),Y
4280 INY:PLA:STA R4H:STA (R5L),Y
4290 LDA R4L:SEC:SBC#1
4300 CLC:ROL A:CLC:ADC#4
4310 CLC:ADC R5L:STA R6L
4320 LDA#0:ADC R5H:STA R6H
4330 INY:LDA R6L:STA (R5L),Y
4340 INY:LDA R6H:STA (R5L),Y
4350 STY R7H:LDA#0:STA R7L:STA R3H
4360 LDA#2:STA R2L
4370.DMLP LDA#0:STA R3L:STA R3H
4380 PLA:CLC:ADC#1:STA R1L
4390 PLA:ADC#0:STA R1H
4400 JSR AX:INC R7L
4410 LDA R7L:CMP R4L:BEQ DMLA
4420 LDY R7H
4430 INY:LDA R3L:STA (R5L),Y:STA R2L
4440 INY:LDA R3H:STA (R5L),Y:STA R2H
4450 LDA#2:STA R3L:STA R3H:BEQ DMLP
4460.DMLA
4470 LDA R6L:CLC:ADC R3L:STA FVL
4480 LDA R6H:ADC R3H:STA FVH
4490 LDY#0
4500.DAL LDA#0:STA (R6L),Y
4510 LDA FVH:CMP R6H:BNE DMI
4520 LDA FVL:CMP R6L:BEQ DMX
4530.DMI INCR6L:BNE DAL:INCR6H:BNE DAL
4540.DMX LDA#3:JMP SR
4550.GTA
4560 PLA:STA R7L:PLA:STA R7H
4570 LDY#1:LDA (PL),Y:STA R1L
4580 INY:LDA (PL),Y:STA R1H
4590 DEY:LDA (R1L),Y:STA R5H
4600 DEY:LDA (R1L),Y:STA R5L
4610 ORA R5H:BEQ GTZ
4620 LDA (R5L),Y:STA R4L
4630 LDY#2:LDA (R5L),Y:STA R3L
4640 INY:LDA (R5L),Y:STA R3H
4650 PLA:STA R1L:PLA:STA R1H
4660 CLC:ROL R1L:ROL R1H
4670 LDA R1L:CLC:ADC R3L:STA R3L
4680 LDA R1H:ADC R3H:STA R3H
4690 LDA R4L:CMP#1:BEQ GTX
4700 LDA#1:STA R4H
4710.GTL PLA:STA R1L:PLA:STA R1H
4720 INY:LDA (R5L),Y:STA R2L
4730 INY:LDA (R5L),Y:STA R2H
4740 JSR AX:INC R4H
4750 LDA R4H:CMP R4L:BNE GTL
4760.GTX LDA R7H:PHA:LDA R7L:PHA:RTS
4770.GTZ LDA#11:JMP EXIT
4780.AX
4790 LDX#8:LDA R1H:BEQ DML
4800 LDY R2H:STA R2H:STY R1H
4810 LDA R1L:LDY R2L:STA R2L:STY R1L
4820.DML CLC:ROR R2H:ROR R2L:BCS DMA
4830.DMC CLC:ROL R1L:ROL R1H
4840 DEX:BNE DML:RTS
4850.DMA LDA R1L:CLC:ADC R3L:STA R3L
4860 LDA R1H:ADC R3H:STA R3H:JMP DMC
4870
4880.vdu
4890 LDY#1:LDA (PL),Y
4900 TAX:INY
4910.DS LDA (PL),Y:JSR OSWRITE
4920 INY:DEX:BNE DS
4930 TYA:JMP SR
4940
4950.cl
4960 LDA PL:CLC:ADC#2:TAX
4970 LDA PH:ADC#0:TAY
4980 JSR OSCLI
4990 LDY#1:LDA (PL),Y:CLC:ADC#2
5000 JMP SR
5010
5020.sqr
5030 PLA:STA R4L:STA R5L
5040 PLA:STA R4H:STA R5H
5050 BMI QE
5060 CLC:ROR R5H:ROR R5L:LDA#10:STA SQ
5070.QA
5080 LDA R4L:STA R2L:LDA R4H:STA R2H
5090 LDA R5L:STA R3L:LDA R5H:STA R3H
5100 JSR DM
5110 LDA R2L:CLC:ADC R5L:STA R5L
5120 LDA R2H:ADC R5H:STA R5H
5130 CLC:ROR R5H:ROR R5L
5140 DEC SQ:BNE QA
5150 LDA R5H:PHA:LDA R5L:PHA
5160 JMP SX
5170.QE LDA#22:JMP EXIT
5180
5190.sgn
5200 PLA:STA R1L:PLA:BMI SM
5210 ORA R1L:BEQ SZ
5220 LDA#0:PHA:LDA#1:PHA:JMP SR
5230.SM LDA#&FF:PHA:PHA:JMP SX
5240.SZ LDA#0:PHA:PHA:JMP SX
5250
5260.abs
5270 PLA:STA R1L:PLA:BMI AM
5280 PHA:LDA R1L:PHA:JMP SX
5290.AM STA R1H:LDA#0:SEC:SBC R1L
5300 TAX:LDA#0:SBC R1H:PHA:TXA:PHA
5310 JMP SX
5320
5330.get LDA#0:PHA
5340.gp JSR OSRDCH:BCS ge
5350 PHA:JMP SX
5360.ge CMP#27:BNE gp
5370 LDA#126:JSR OSBYTE:BNE gp
5380
5390.adv
5400 PLA:TAX:PLA:TAY:LDA#&80
5410 JSR OSBYTE:TYA:PHA:TXA:PHA
5420 JMP SX
5430
5440.pos
5450 LDA#&86:JSR OSBYTE:LDA#0:PHA
5460 TXA:PHA:JMP SX
5470
5480.vpo
5490 LDA#&86:JSR OSBYTE:LDA#0:PHA
5500 TYA:PHA:JMP SX
5510
5520.poi
5530 PLA:STA R2L:PLA:STA R2H
5540 PLA:STA R1L:PLA:STA R1H
5550 LDX#R1L:LDY#0:LDA#&9:JSR OSWORD
5560 LDA R3L:CMP#&FF:BEQ PM
5570 LDA#0:PHA:LDA R3L:PHA
5580 JMP SX
5590.PM PHA:PHA:LDA#1:JMP SR
5600
5610.cal
5620 PLA:STA R1L:PLA:STA R1H
5630 LDA#((CR-1)DIV256):PHA
5640 LDA#((CR-1)MOD256):PHA
5650 LDA&42C:ROL A:LDX&460:LDY&464
5660 LDA&404:JMP(R1L)
5670.CR JMP SX
5680
5690.nct
5700 PLA:STA R1L:PLA:STA R1H
5710 LDA#&FF:SEC:SBC R1L:TAY
5720 LDA#&FF:SBC R1H:PHA:TYA:PHA
5730 JMP SX
5740
5750.env
5760 LDX#13:LDY#14
5770.EL PLA:STA R1L,X:PLA
5780 DEX:DEY:BNE EL
5790 LDX#R1L:LDY#0:LDA#&8:JSR OSWORD
5800 JMP SX
5810
5820.rtf
5830 PLA:TAY:PLA:TAX
5840 PLA:STA PL:PLA:STA PH
5850 TXA:PHA:TYA:PHA
5860 JMP SF
5870
5880.nxt
5890 LDY#0:LDA FSL:CLC:ADC (FAL),Y
5900 STA (FAL),Y:STA R3L
5910 INY:LDA FSH:ADC (FAL),Y
5920 STA (FAL),Y:STA R3H
5930 LDA FSH:BPL NP
5940 LDA R3L:SEC:SBC FLL
5950 LDA R3H:SBC FLH
5960 BVS NN:BMI NE:BPL NN
5970.NP LDA FLL:SEC:SBC R3L
5980 LDA FLH:SBC R3H:BVS NN:BMI NE
5990.NN LDA FJL:STA PL:LDA FJH:STA PH
6000 JMP SF
6010.NE LDX FP:LDY#0:DEX
6020.NXL LDA &500,X:STA FAL,Y
6030 DEX:INY:CPY#8:BNE NXL:INX:STX FP
6040 JMP SX
6050
6060.EXIT
6070 STA ER
6080 LDA SP:TSX:STX SP:TAX:TXS
6090 LDA RH:PHA:LDA RL:PHA
6100 RTS
6110]
6120NEXT
6130ENDPROC
6140
6150DEFPROCSETUP
6160PL=&70:PH=&71:JTL=&72:JTH=&73
6170R1L=&74:R1H=&75:R2L=&76:R2H=&77
6180R3L=&78:R3H=&79:R4L=&7A:R4H=&7B
6190R5L=&7C:R5H=&7D:R6L=&7E:R6H=&7F
6200R7L=&80:R7H=&81
6210CF=&82:SQ=&83:RL=&84:RH=&85
6220FAL=&86:FAH=&87:FLL=&88:FLH=&89
6230FSL=&8A:FSH=&8B:FJL=&8C:FJH=&8D
6240FP=&8E
6250OSWRITE=&FFEE:OSBYTE=&FFF4
6260OSWORD=&FFF1:OSCLI=&FFF7
6270OSRDCH=&FFE0
6280P%=page%
6290PROCCOPY:JT=P%
6300RT=JT+160
6310ENDPROC
6320
6330DEFPROCJUMPTAB
6340PROCE(add,2):PROCE(sub,4)
6350PROCE(mul,6):PROCE(div,8)
6360PROCE(gtt,10):PROCE(ltt,12)
6370PROCE(geq,14):PROCE(leq,16)
6380PROCE(equ,18):PROCE(neq,20)
6390PROCE(neg,22):PROCE(vdu,24)
6400PROCE(ink,26):PROCE(rts,28)
6410PROCE(ldi,30):PROCE(sti,32)
6420PROCE(end,34):PROCE(pri,36)
6430PROCE(dup,38):PROCE(swp,40)
6440PROCE(drp,42):PROCE(mod,44)
6450PROCE(vdd,46):PROCE(vdl,48)
6460PROCE(and,50):PROCE(ldt,52)
6470PROCE(stt,54):PROCE(and,56)
6480PROCE(ora,58):PROCE(eor,60)
6490PROCE(rnd,62):PROCE(jmp,64)
6500PROCE(jsr,66):PROCE(jmr,68)
6510PROCE(lda,70):PROCE(sta,72)
6520PROCE(ldi,74):PROCE(for,76)
6530PROCE(ldn,80):PROCE(stn,82)
6540PROCE(dmn,84):PROCE(dma,86)
6550PROCE(vdm,90):PROCE(cli,92)
6560PROCE(sqr,102):PROCE(sgn,104)
6570PROCE(abs,106):PROCE(get,108)
6580PROCE(adv,110):PROCE(pos,112)
6590PROCE(vpo,114):PROCE(poi,116)
6600PROCE(cal,118):PROCE(not,120)
6610PROCE(env,122)
6620PROCE(rtf,126):PROCE(nxt,132)
6630ENDPROC
6640
6650DEFPROCE(opr,num)
6660JT?num=opr MOD256
6670JT?(num+1)=opr DIV256
6680ENDPROC
6690
6700DEFPROCSTEST
6710P%?4=34:!P%=(P%+5)+(P%+5)*&10000
6720P%=P%+5
6730ENDPROC
6740
6750DEFPROCCOPY
6760CC%=TOP
6770REPEAT CC%=CC%-1:UNTIL ?CC%=&FA
6780IF CC%?1<>53 ORCC%?2<>&FA GOTO6770
6790CC%=CC%-3
6800FOR C%=CC%TO TOP
6810?P%=?C%:P%=P%+1:NEXT:P%=P%-1
6820SLOC%=P%:P%=P%+100
6830ENDPROC
6840
6850DEFPROCFINISH
6860toprts%=P%:!(SLOC%-4)=toprts%
6870PROCSTEST
6880$(SLOC%+8)="*SAVE RTS "+STR$~
 page%+" "+STR$~(P%+1)
6890PRINT''"<<< TOP OF RTS IS =
 ";toprts%;" >>>"
6900PRINT''"This number should be entered
 in the"''"compiler."''"Reseting PAGE to
 its usual value"''"and then typing RUN will
 allow you"''"to save your run time syst
 em."''
6910ENDPROC
6920
6930REM type in line 6960 exactly as
6940REM shown.
6950
6960STOP:STOP
6970REM
6980REM ===============================
6990REM  T.C. BASIC RTS
7000REM  (c) D.J. Pilling
7010REM  January 1985
7020REM ===============================
7030MODE7:PRINT"T.C. BASIC RTS "
7040LOMEM=TOP+40:HIMEM=TOP+100
7050T%=TOP:O%=T%+8:L%=O%+6:S%=T%+4
7060PRINT'MODULE CONTAINS '$L%
7070X%=O%MOD256:Y%=O%DIV256
7080PRINT'(1) LOAD NEW CODE "
7090PRINT'(2) RUN  CODE "
7100PRINT'(3) SAVE MODULE"
7110I%=GET:I%=I%-ASC"0":IFI%<1 OR
  I%>3 GOTO7110
7120ONI%GOTO 7130,7220,7270
7130INPUT'FILE NAME "$L%:*OPT1,1
7140*OPT2,1
7150H%=OPENUP$L%
7160INPUT#H%,C%,F%,E%,$L%
7170FOR J%=0 TO E%-C%+3:S%?J%=BGET#H%:NEXT
7180CLOSE#H%
7190*OPT
7200$L%="F."+RIGHT$($L%,LEN$L%-2)+"
 "+STR$~PAGE+" "+STR$~(J%+S%+1)
7210GOTO7030
7220?&70=S%MOD256:?&71=S%DIV256
7230CALL (T%+260)
7240PRINT'':IF?&83=44PRINT"END OF CODE
 "ELSEIF?&83=30PRINT"DIVISION BY ZERO
 "ELSEIF?&83=22PRINT"NEGATIVE SQUARE
 ROOT"ELSEIF?&83=11PRINT"NO ARRAY DIM
 "ELSEIF?&83=33PRINT"BAD DIM"
7250PRINT" RETURN  to reset ";
7260REPEAT UNTIL GET=13:GOTO7030
7270CALL&FFF7:GOTO7030
```

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COMMODORE 64, BBC AND SPECTRUM

THE PROGRAMS given here will enable Spectrum, BBC, and CBM-64 owners to download via *Your Computer's* Telsoft service. Each month for each machine we transmit at least one — and usually two — of the main programs appearing in the current issue. Also available is the full user to user communications program, Dialsoft.

So far OE LTD's Telemed 2 and the VTX 5000 modems have been tested with the BBC and Spectrum but the service also works with

Figure 1.

```
5 REM   HEX LOADER FOR CBM 64   FIG.1
6 REM
10 FOR I=680 TO 727:READA:POKEI,A:T=T+A
20 NEXT:IF T=67.6 THEN GOTO 100
30 PRINT"ERROR IN DATA ":T-6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,8,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 68,79,87,78,76,79,65,68
100 SA=51000:LA=52855
110 INPUT"START ADDRESS";A
120 IF (A<SA) OR (A>LA) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT:PRINT"ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA;:INPUTD$
160 IF D$="END" THEN GOTO 900
170 IF LEN(D$)=20 THEN GOTO 190
180 PRINT"WRONG LENGTH":GOTO 150
190 FOR B=0 TO 7:B$=MID$(D$,2*B+1,2)
200 GOSUB 300:IF E=1 THEN GOTO 280
210 POKE A+B,D:T=T+D:NEXT
220 D$=MID$(I$,10,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR":GOTO 150
260 A = A+8:IF A<LF THEN GOTO 150
270 GOTO 800
280 PRINT TAB(8+2*B+D)C$"??"
290 B=8:NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B$)
310 C$=MID$(B$,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+X:NEXT:RETURN
400 X=ASC(C$)-48:IF X<0 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H$="0123456789FBCIEF"
510 FOR A=SA TO LA STEP 8
520 PRINT A;"? ";:T=(F-32768)AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT"=";
560 Y=INT(T/256):PRINT MID$(H$,Y+1,1);
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H$,INT(X/16)+1,1);
610 PRINT MID$(H$,1+(XAND15),1);:RETURN
800 SYS 680:C$=CHR$(34)
810 PRINT:PRINT" TO RELOAD CODE :"
815 PRINT:PRINT"  LOAD"C$"DOWNLOAD";
820 PRINTC$",1  (RETURN)"
825 PRINT:PRINT"  THEN TYPE   NEW";
830 PRINT"  (RETURN)"
835 PRINT:PRINT"TO RUN THE PROGRAM";
840 PRINT"  SYS 51000  (RETURN)"
900 PRINT:PRINT:PRINT"1  ENTER DATA"
910 PRINT:PRINT"2  PRINT DATA"
920 PRINT:PRINT"3  SAVE DATA"
980 INPUT Z:ON Z GOTO 100,500,800
```

Figure 2.

```
51000 ? A9068D21D08D20D0=5E4
51008 ? A90FED0E02F90E20=2E4
51016 ? D2FFA0006D15D0A9=4DD
51024 ? FF8D0A02BA8E92CE=510
51032 ? 20CAC92AC7C020F8=4D5
51040 ? CAHD80CEC93,F023=532
51048 ? C935F014C93ED006=43F
51056 ? 206EC74C5BC7A914=410
51064 ? 20D2FF202FCBU9D3=52E
51072 ? 203FC8A92020D2FF=461
51080 ? 4C93C94C4AC82063=411
51088 ? CC2A22CDAC5B29FD=4F1
51096 ? F9CE83FE2028CDA0=547
51104 ? 002095CC202FCBC9=404
51112 ? 44F0ABC954A0ED20=4E
51120 ? D2FFA901D007A044=4EF
51128 ? 20D2FFA508E5BF20=4B9
51136 ? 25CDA9002AABCCA9=4A3
51144 ? BD95FDA9CD85FEA0=6A0
51152 ? 002095CC2025CD20=383
51160 ? 95CC9848A004BC03=4CC
51168 ? CE20D8C9E8A62025=4C4
51176 ? CD2095CC9849A9A6=415
51184 ? 8DA3CE20D8C9ADA7=5E3
51192 ? CE85FBADA8CE85FC=6EA
51200 ? 68A82060CBA90185=38A
51208 ? B085B998AC93F0CE=538
51216 ? 20BDFFAEA9CEACAA=567
51224 ? CEE8D001C82025CD=479
51232 ? A9FB20D8FF20F1CB=597
51240 ? 6020B9CCC90DD00B=3FE
51248 ? A90085C7A92020D2=3E0
51256 ? FFA9CD20D2FF60A9=4E7
51264 ? 0D2029C8990D20D2=306
51272 ? FF5A206DCCA000A9=43F
51280 ? FF9993CEC8D0FA20=5FB
51288 ? D2CB9AFB20D2CBB0=5ED
51296 ? FB0D72CEFA000AC7C=4D0
51304 ? CE8C7DCE202EDCAD=4D4
51312 ? 72CE29F0C9800D0E4=5C6
51320 ? 20D2CBB0DA9973CF=549
51328 ? C8202EDCC0G0I0F6=4EB
51336 ? F000AD76CE2980D0=492
51344 ? 0FA52D85FB18A52C=3D0
51352 ? 6D75CE85FC4CA0C8=587
51360 ? A378CED5FBAD74CE=607
51368 ? 85FC20D2CBB0AE20=55E
51376 ? D9CC20D2FFC820D9=687
51384 ? CC202ECC3019DA2A=528
51392 ? A92023D2FFA375CE=56A
51400 ? 202EC32032CBB087=4D7
51408 ? CD7CCEF80BA95820=583
51416 ? D2FF2030C84C57C8=52C
51424 ? 20D2CBB0F9CD7DCE=65D
51432 ? D0EBAD75CEA8993=687
51440 ? CED00E2030C0A991=4FE
51448 ? 20D2FF4C7EC94C57=51F
51456 ? C6A00A0C7CCE8L7D=447
51464 ? CE20D2CBB0F391FB=5BF
51472 ? 202ECCC8CC77CE30=4D3
51480 ? F020D2CB30E0CD7C=59E
51488 ? CEF000A95820D2FF=4D8
51496 ? 4C57C220D2CEB0CE=4CE
51504 ? CD7DCEF0034C23C9=473
51512 ? 20ACCB2039C8AD75=409
51520 ? 2EA0A90099930EAD=506
51528 ? 84CEC902D02520BC=436
51536 ? CBA9C820F3CBF95F=560
51544 ? 2016CDA95020F3CB=432
51552 ? 20C77BAC732EC888=54F
51560 ? B993CED02390D0F7=5D4
51568 ? 4C5BC7A955291CCD=3DF
51576 ? 20F1CB4C63C9AC77=4EF
51584 ? CE20D2CB88D0FA20=57D
51592 ? D2CB2AD2CB4C47C9=53E
51600 ? 4C5CFA852B85FBA5=4F5
51608 ? 2C85FCA000B,FB99=52A
51616 ? 2200C8B1FB8523F0=4CE
51624 ? 0BF52285FAA52303=447
51632 ? FC4C9BC913A5FB69=57D
51640 ? 02852D852F8531A5=37B
51648 ? FC6900852E853085=412
51656 ? 3268206BCCA9C28D=3E1
51664 ? 84CEA900B8D02E60=4A3
51672 ? 8E81CE8C82CEA200=538
51680 ? A9098DCDCE202FCB=4D4
51688 ? C914F016C990DF051=4E2
51696 ? C924D01520D2FF8D=544
51704 ? C3CEE84CE5C9EA00=54B
51712 ? D0E3EA00F0ADF20D2=554
51720 ? FFCA4LE5C9C93090=554
51728 ? D4C93A901540ADC3=444
51736 ? CEC924F0E46E4CE5=46A
51744 ? C9E8C54190DFC947=4BA
51752 ? B0EB2002FF38E930=4J5
51760 ? C90A9002E907E005=36A
51768 ? F0A89DC3CEE84CE5=610
51776 ? C9F000F0AEE001D0=52A
51784 ? 07ADC3CEC924F095=4FE
51792 ? A92020D2FFA9F79D=54F
51800 ? C3CEA2008EFCE0C=344
51808 ? D0CE0ED1CE8ED2CE=659
51816 ? A8C3CEC924I00FA9=512
51824 ? 0F8DCDCEE8BDC3CE=5DD
51832 ? C9FFF01D20C8CA00=5B2
51840 ? 3418BDC3CE63CFCE=524
51848 ? 8DCFCEA9006DD0CE=566
51856 ? 8DD0CEB020E84C75=524
51864 ? CAAICFCEFCB4CE99=6A2
51872 ? A3CEC9ADD0CE99A3=650
51880 ? CEC3180C83CEAC82=561
51888 ? CEAES1CE602025CD=4ED
51896 ? A200DD41CEC921F0=509
51904 ? 0720D2FFE54CBACA=578
51912 ? 4CDEC9ADCDCE8DCE=65E
51920 ? CE9DCFCE8DD1CEAD=6C1
51928 ? D0CE8DD2CE19DD1=639
51936 ? CE6DCFCE8DCFCEFD=68F
51944 ? D2CE6DD0CE8DD0CE=6BE
51952 ? B005CECECFD0E664=625
51960 ? 20F3CC190F8D8602=4:4
51968 ? A95185FDA9CD85FE=575
51976 ? A000209DCC2025CI=343
51984 ? 209DCC209DCC209D=3D
51992 ? CC2022CD2099CC20=3A8
52000 ? 95CC2022CD2095CC=411
52008 ? 202FCB20D2FF600E=421
52016 ? 8:CE8CA2CE2063CC=4B0
52024 ? 2EECCC20CACCC900=48F
52032 ? D00D20FDCCC931F0=4F0
52040 ? 062001CC4C39C80D=214
52048 ? 80CEAE01CEAC82CE=597
52056 ? 60AE92CE9A4C5BC7=4CE
52064 ? 2022CDA92285FDA9=465
52072 ? CE85FEA000209DCC=40A
52080 ? 2025CD900FA92099=393
52088 ? 33CE8830FA8D93CE=619
52096 ? 202FCBC914D010C0=417
52104 ? 00F0F520D2FFC0A3=58F
52112 ? 209993CE4C80CBC9=509
52120 ? 0DF00B20D2FF9993=4B0
52128 ? C5C8C010D0JAA920=579
52136 ? 20D2FF60A9202002=4B4
52144 ? FFA94F20D2FFA54B=58C
52152 ? 20D2FF60A9138D00=452
52160 ? DEA9128D00IF60A9=1CD
52168 ? 539D00DEA9528DA0=40E
52176 ? DE60A996.80D87CE=547
52184 ? 8C82CEAC82CE20A4=4D4
52192 ? CC20ECCCCF87CED0=6/7
52200 ? 0230E020FDCCB0EE=539
52208 ? 50A9FA8C82CEA820=597
52216 ? 04CD88D0FAAC82CE=616
52224 ? 602004CC9AA2A0CF=3EE
52232 ? 10FIAA2069CC6020=454
52240 ? 25CDA90220ABCC20=364
52248 ? 95CCAD8ECE20D2FF=37J
52256 ? A920200D2FFA90320=3A6
52264 ? ABCC20D0C9604D7D=48F
52272 ? CE8D7DCEA200AD7D=4AA
52280 ? CE2AA010AD7UCE49=411
52288 ? 083D7DCEAD7DCE49=460
52296 ? 100D7DCE2E7CCE2E=3D5
52304 ? 7DCECADDE160AA00=518
52312 ? A9C095A0D14CAC018=40E
52320 ? D0F6C0A99320D2FF=593
52328 ? 5048A5A2230FJ01F=37E
52336 ? A5D448A5A229.0F0=4A1
52344 ? A5A4A4CCC0CCP920=42B
52352 ? 20D2FFF90085D4A5=51C
52360 ? 5D20D2FF6855D468=59F
52368 ? 602052FC031FJC9=620
52376 ? 21D0F6C0602025CD=4B9
52384 ? A90C20ABCC2C95CC=46D
52392 ? 60A9058E61CEAAA9=4E5
52400 ? 2020D2FFC9D0FAAF=635
52408 ? 31C560C914F008C9=505
52416 ? 7FF00160A91460A9=456
52424 ? 7F6020E4FFC9C190=5C4
52432 ? 07C9DB100330E960=4AF
52440 ? 60C941900EC95B90=494
52448 ? 00C961900EC97BB0=49C
52456 ? 0249206040A4000=2D5
52464 ? 20E1FFD0034C03C9=533
52472 ? 2068AA6860AD00CDE=48E
52480 ? 4901EA9603F90050=250
52488 ? AD01IE6848AD000F=3C7
52496 ? 4932676A6860200C=223
52504 ? CD30F38D01DE20EC=508
52512 ? CC602025CD2028CD=373
52520 ? A90D20D2FF604829=3A0
52528 ? F0GA6A6A6A0930C9=32A
52536 ? 3A300318690720D2=21F
52544 ? FF68290F0930C93A=318
52552 ? 300318690720D2FF=2F4
52560 ? 60444F57454C4F41=2C4
52568 ? 44204D454E552131=243
52576 ? 2020205245434549=228
52584 ? 5645210D20202045=1FE
52592 ? 5849542054F2042=28A
52600 ? 415349432136220=22F
52608 ? 2053415645204259=28A
52616 ? 5445532128235553=285
52624 ? 452012205354F50=26D
52632 ? 2092205444F205245=2C4
52640 ? 54555244E20544F20=2CC
52648 ? 4D454E5520292145=29C
52656 ? 4E544552204E554D=2F9
52664 ? 4245522021494620=281
52672 ? 41444452455335320=2E6
52680 ? 495320494E204845=2C8
52688 ? 582C115D9I9D9D9D=475
52696 ? 5D9D9D9D9D9D9D9D=5C0
52704 ? 9D9D9D9D5524546=48
52712 ? 4958205749544920=305
52720 ? 2421535441525420=2E3
52728 ? 4144445245253320=31E
52736 ? 464F522041524541=220
52744 ? 2021464944E414C20=1D3
52752 ? 4144445245535320=236
52760 ? 464F5220415245341=238
52768 ? 20215E524F475241=22C
52776 ? 4D2054495440452D=237
52784 ? 284D415820313620=1E5
52792 ? 4348415227532920=2.9
52800 ? 21124E4F5420564I=21B
52808 ? 4C4944522C20E452=2A5
52816 ? 5920414741494E20=249
52824 ? 3A2021444953432D=216
52832 ? 4F52205441504520=26B
52840 ? 2820442F54202920=1E0
52848 ? 3F2100000000000=0D6
```

TELSOFT

A reminder of how to use the Telsoft service.

a number of other makes. For the CBM-64 it will initially only be available with the OEL Comms pack together with the Telemond 2 or similar modem; later we hope to adapt the service to work with Commodore's modem.

To enter the download program first type in the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. Once the program has been saved you can run it by entering CALL &6000 on the BBC, SYS 51000 on the CBM 64, RANDOMIZE USR 60000 on the Spectrum.

To find out what is available and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is on line, make sure your modem is set up and dial the number appropriate to its speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received you will see "OK" printed if there are no errors; otherwise the program will wait for the blocks to come round again. When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Note that CBM-64 owners will need to use Option 6 if machine code is to be saved.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F87 THEN 280
60 IF A<&2A00 OR A>&6FE7 THEN 20
70 PRINT "&" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-8: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR "
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=8*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9CBA0FEA20120F4,4C6
6A08 :FF20616C204B6DC9,30A
6A10 :31F00DC934F0C9C9,4C8
6A18 :35F0064C0C6A4C47,288
6A20 :6AA9BC20E3FFA9E8,4B2
6A28 :A00042FF20F4FFA9,4FD
6A30 :00A20070F4FFA902,363
6A38 :A20220F4FFA9C0A0,4DB
6A40 :FEA20020F4FF60A9,4EC
6A48 :0C20E3FF20F76B09,439
6A50 :15A20120F4FFA000,3EB
6A58 :A9FFB8999056D0FA,507
6A60 :A915A20120F4FF20,394
6A68 :0C6C90F0200C6C00,348
6A70 :FBA0008477847B04,416
6A78 :79847A0478B67020,388
6A80 :D560A57329F0C930,489
6A88 :D0E7200C6C80D879,46B
6A90 :7100CB20056DC009,364
6A98 :D0FA0000A5742900,422
6AA0 :D000A51C85761BA5,354
6AA8 :1D65738577200C6C,289
6AB0 :00E520E3FF202805,524
6AB8 :6DC01050F0457320,435
6AC0 :B26D200C6C80A0C5,3FF
6AC8 :7AF000495E20E3FF,478
6AD0 :20E7FF4C676A200C,34F
6AD8 :6C300CC57BF000A9,40C
6AE0 :5020E3FF20E7FF4C,4AC
6AE8 :676AA573A0B9056F,43E
6AF0 :D00E20E7FFA90B20,380
6AF8 :E3FF4CB3684C676A,469
6B00 :A000847A047B200C,2C9
6B08 :6CB0F2917620D56D,477
6B10 :CAC475D0F1200C6C,45A
6B18 :D0E3C57AF00BA958,4CE
6B20 :20E3FF20E7FF4C67,4BB
6B28 :6A200C6C80CFC578,3C1
6B30 :F000A95020E3FF4C,447
6B38 :676A20C76820C7FF,429
6B40 :A573A0A90099056F,3F6
6B48 :A58AC98200582807,419
6B50 :6BA9CB20556CA955,30B
6B58 :20106FA95020556C,298
6B60 :A915A20120F4FF20,394
6B68 :F76BA471C0B0B985,505
6B70 :6FD0519BD0F7A90C,4A4
6B78 :20E3FF20A56DA95A,437
6B80 :8582A96F8503A907,307
6B88 :20006E20FB6D20A8,2DE
6B90 :6DA90520006EA9B8,2DA
6B98 :20E3FF20FB6DA9D2,502
6BA0 :20E0FF4C0C6AA955,3BF
6BA8 :20306EA99620556C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :0BD0FA200C6C200C,315
6BC0 :6C4C406B4C6C6AA9,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FFA96B20E3FF60A9,51E
6BD8 :9CA000A6BAE002D0,41E
6BE0 :0BA21320F4FFA212,387
6BE8 :20F4FF60A29[illegible],4C0
6BF0 :FFA29620F4FF60A9,553
6BF8 :9CA000A6BAE002D0,41E
6C00 :EBA25320F4FFA252,4E7
6C08 :20F4FF6010A99405,44F
6C10 :BFB47EA991A20020,38D
6C18 :F4FFB009C0E7D005,448
6C20 :6B684C0C6A647E20,2D4
6C28 :495CC68FD0023B60,374
6C30 :A58AC902D0062079,369
6C38 :6EB0EC60A991F201,447
6C40 :20F4FF9BA47EB00F,55C
6C48 :60BAA2D2CAEBCAD0,5AF
6C50 :FEAA60A900847EA0,458
6C58 :204962080DFAA47E,449
6C60 :60A9EDA000A2FF20,452
6C68 :F4FFA900085DA99C,460
6C70 :20E3FF20AB6DA904,3E4
6C78 :20006EA90985B2A9,2F0
6C80 :6FA503A00020FB6D,392
6C88 :20156DC941F00BC9,370
6C90 :42F01C943F0174C,3A2
6C98 :616CA900A20120F4,335
6CA0 :FF4C376CA900A203,3C4
6CA8 :20F4FF4C876CA900,433
6CB0 :A20420F4FFE6BAA5,4CE
6CB8 :7C20E3FFA4712068,46B
6CC0 :6DA90820006E20FB,2C4
6CC8 :5DA0172019ADC941,230
6CD0 :F00BC942F011C943,413
6CD8 :F01F4C616CA907A2,372
6CE0 :0120F4FF4C096D39,37F
6CE8 :07A20320F4FF4C09,314
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E6BAA58AC9070D04,443
6D00 :A9EBA000A20120F4,3EB
6D08 :FFF57C20E3FF2053,495
6D10 :6C20535C6020A96D,3E3
6D18 :A90520006E20FB6D,2C1
6D20 :20AB6DA90520006E,274
6D28 :20FB6D20AB6DA705,36B
6D30 :20006E20FB6B70AB,2DE
6D38 :6D347EA90320006E,2A9
6D40 :A90220E0FF857C60,4DB
6D48 :A90C20E3FF20AB6D,3CF
6D50 :390720006EA99A05,386
6D58 :82A96E85B3A00020,351
6D60 :FB6D20A96D20996D,3C0
6D68 :20996D20996D209D,317
6D70 :6DA90A20006E20F0,2C6
6D78 :6D20AB6DA9022000,270
6D80 :6E20FB6D20AB6E20,34B
6D88 :E7FFA9E22070FF40,5AB
6D90 :A90FA20020F4FF60,3D5
6D98 :60A90B20006E20FB,2B7
6DA0 :6D20AB6D6020AB6D,33A
6DA8 :20AB6D20E3FF20E7,445
6DB0 :FF60A029F06A6A6A,3FE
6DB8 :6A0930C93A300318,1F1
6DC0 :690720E3FF60290F,312
6DC8 :0930C93A30031B69,1F0
6DD0 :0720E3FF60437D06,3AE
6DD8 :7BA200A57B2A900C,30E
6DE0 :A57B4900E570857A,390
6DE8 :4910857A267A2678,299
6DF0 :CAD0C36020F37FCB,5AC
6DF8 :B182C90000F6C060,4F7
6E00 :B57DAAA92020E3FF,473
6E08 :CAD0FAA67D60C97F,55F
6E10 :D0ABA9B620F4FFE0,4FD
6E18 :00F012A97FC92000,3C3
6E20 :0EC90AF00AC90DF0,3F1
6E28 :06C907F002A90060,2E1
6E30 :057C867D847EA991,440
6E38 :A20120F4FFA903A2,404
6E40 :0720F4FFA996A200,403
6E48 :20F4FF982902F0F4,48A
6E50 :347CA997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FF00,4[illegible]
6E68 :09C007D0056B6B4C,2C1
6E70 :0C6A857CA67D347E,3D[illegible]
6E78 :6B847EB67DA996A2,445
6E80 :0020F4FF9B2901F0,3CD
6E88 :0BA996A20920F4FF,400
6E90 :5B1B900130A47DA1,140
6E98 :3E60444F574E4C4F,2E1
6EA0 :4144494E47204D45,215
6EA8 :4E550D3120202052,193
6EB0 :4543454956450D34,1F7
6EB8 :2020205345542042,1AE
6EC0 :5175642052617465,256
6EC8 :0D32202020455049,130
6ED0 :5420544F20424153,20D
6ED8 :49430D454E444552,217
6EE0 :204E554D4245520D,1F6
6EE8 :2020555345204354,1EC
6EF0 :524C204720544F20,1F5
6EF8 :52455455524E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D53455420545241,200
6F10 :4E534D4954204261,24E
6F18 :756420526174650D,292
6F20 :4120202037352042,16[illegible]
6F28 :6175640D42202033,1FC
6F30 :303020426175640D,209
6F38 :4320313230302042,188
6F40 :6175640D53455420,283
6F48 :5245434549564520,223
6F50 :4251756420526174,2C3
6F58 :650D50524F475241,23D
6F60 :4D20204F4F414445,1F2
6F68 :4420206F600D5052,20D
6F70 :45535320414E5920,213
6F78 :4B455920464F5220,218
6F80 :48454E550D202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k          fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 280
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " : ";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>20 THEN GO TO 260
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-8: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ";";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307E3CD15,4C7
60008 :EDCD36ECCD66EDCD,631
60016 :50EDCD47EE38F8CD,5AF
60024 :0BEDFE31CA99EAFE,69A
60032 :35C007EAC366EACD,5D0
60040 :15ED3EFACD04EDCD,4FD
60048 :15EDC9CD15EDC366,553
60056 :EAC066ED11E5EEB6,3BC
60064 :003EFF121310FCCD,458
60072 :15CE11CDEEAA173E,3D2
60080 :20121310FCCD1FED,3DA
60088 :30FACD50EDCD1FED,3B8
60096 :38FB3265EF3E0032,3E9
60104 :3CFE326FEF3270EF,544
60112 :3A65EFCDEEEC3A65,3A1
60120 :EFE6F0FE0020DE0E,627
60128 :091165EFCD1FEDDA,581
60136 :AAEA1312CDEBEC0D,552
60144 :20F23A69EFE60020,51A
60152 :00214E5C3A6BEF0E,36C
60160 :004709226BEF0E00,1D4
60168 :11CDEECD1FED3B9A,47F
60176 :1213A0CDEDCC70FE,45C
60184 :1020F03A6BEFCD01,447
60192 :EDCD1FEDDAAAEA21,574
60200 :6FEF8E20133E5811,325
60208 :C00E12133E0012CD,340
60216 :D7ECCDA6ECC3AAEA,681
60224 :CD1FEDDAAAEA2170,518
60232 :EF0E20E121E5EE3A,524
60240 :A0EF856F3E000C67,3CC
60248 :3E000E2000CDEC7E,40F
60256 :3E2132005CC3FFEB,482
60264 :3E00326FEF3270EF,3C7
60272 :ED5B6BEF0E00CD1F,40C
60280 :EDDAAAEA3273EFCE,634
60288 :EBEC3A6BEFFE0028,50B
60296 :053AA9EFE6003A73,432
60304 :EF12130C3A6AEF09,3FC
60312 :20DCCD1FEDDAAAFA,5DB
60320 :216FEF0EC220EBCD,504
60328 :1FEDDAAAEA2170EF,5A2
60336 :0EC22DEB3E6F32E2,509
60344 :6E3E6A32E3EE3E00,490
60352 :32E4EE3A005CFE21,501
60360 :2003CD15EECD07EC,553
60368 :CDA6EC21E5EE3A60,5C5
60376 :EF856F3E000C6736,422
60384 :0021E5EEED4866EF,5C1
60392 :0C7EFE00C200EA23,4FC
60400 :0D20F63EFACD04ED,509
60408 :3E01D3FEC366EA3D,5EB
60416 :1FED30F8C30DEA73,604
60424 :0603AFD3FF10FB3E,3DB
60432 :40D3FF3EFFD3FF3E,56F
60440 :31D3FF3E0F320F5C,385
60448 :320F5C32405C3E01,250
60456 :03FE21915CCB9EFB,56B
60464 :CD50EDC366EACD15,52F
60472 :EEC066ED3E0103FE,556
60480 :2165EE3E00CD0FEC,442
60488 :CD04ECCDA3ECCDA6,654
60496 :EC23CD77EC2077EC,5BF
60504 :CDA0ECCD04ECCDA6,561
60512 :EC233E00CD0FECCD,4CF
60520 :04EC23CDA3EC3C03,499
60528 :CD0FECCD04ECC9CD,688
60536 :A3EC3E07CD0FECCD,561
60544 :04EC23C97EFE00C8,520
60552 :CD00ED23C3D4EDFF,651
60560 :00C8F53E20CD00ED,520
60568 :F13DC20FECCDA0EC,65C
60576 :CDA3ECCDA5EC3E0D,5A6
60584 :CD00ED9FFF320C5C,574
60592 :C9F513E6F0CB1FCB,60C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3AFAC6ECC6071213,499
60616 :F1E60FF630FE3AFA,605
60624 :D4ECC6071213C921,46C
60632 :CDEEE5CD04ECE106,69C
60640 :173E20772310FC3E,339
60648 :0077C9E52170EFAE,538
60656 :17CD3E007CA7CB17,449
60664 :30007EEE00773A6F,3C9
60672 :EFEE10326FEF3721,305
60680 :6FEFC91623CB160E,358
60688 :20F2C1E1C9110801,394
60696 :216A00CD0503C93E,32F
60704 :963277EFCD47EDDA,529
60712 :2EEDF1C366EACDAC,5C0
60720 :E07BE601F607D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77ED30EBC9CD,5F0
60744 :47EE08FECBC837C9,5E6
60752 :F5D8FF3A01EFFE00,5C7
60760 :20043E3C10023F77,187
60768 :D3FFDB7FF1C9F53A,675
60776 :01EFFE0020043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :00D0FFC60037CA0B,59[illegible]
60800 :FFE60237C8DBFFE6,626
60808 :382004DB7F47C93A,3E0
60816 :31EFFE0020043E37,397
60824 :10023F76D3FFDB7F,452
60832 :C9CD47ED3A73EFD8,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20F3F1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,70D
60864 :7F2013CDF9EDFE0C,557
60872 :200CFE0D20053E20,28A
60880 :D73E0D371E103E20,34F
60888 :D73E00D73A005CFE,4EB
60896 :2121003E00D73E0F,2FA
60904 :D73E00D7F1E1D1C1,640
60912 :C9FE07201CFECE28,4F3
60920 :19FE0C2014FE0820,308
60928 :10FF0D200CFE20FA,367
60936 :0FEEFE00FA11EE3E,4BA
60944 :00C93E07C9CD680D,32C
60952 :3E02CD01163E1832,1C4
60960 :A95CC93E121601CD,302
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3EB
60984 :CD0116CD47EE30F8,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :3B5CCE6F200C3A00,2AF
61008 :5CF5213B5CCBAEF1,4C3
61016 :A7C937C9F5110000,3DE
61024 :CD18EDF1C9444F57,4D6
61032 :4E4C4F4144494E47,284
61040 :204D454E55003120,216
61048 :2020524543454956,275
61056 :4500352020204576,217
61064 :697420746F204261,32B
61072 :7369630020205573,2DF
61080 :652053796D626F6C,393
61088 :2853606956742020,30B
61096 :204700746F205265,2C9
61104 :7475726E20746F20,39C
61112 :4D454E5520200045,278
61120 :4E544552204E554D,309
61128 :4245522000000000,1C1
```

SPACE JUNK

Nalin Sharma continues his epic for the CBM-64.

HERE IS a reminder of the loading and game instructions for Space Junk.

Insert cassette, press Shift and Run/Stop and start your cassette recorder. Loading time is about two minutes. Put your joystick into Port 2.

Can you retrieve all 32 satellites by mastering control of your ship, which can move up, down, left and right and can also fire bullets?

However, beware of the four yellow junkies which patrol the skies. Unless you can work out how to destroy them you're in trouble! To help you there's a radar at the top of the screen which will pinpoint the junkies and any miscellaneous junk which appears from time to time and can be retrieved for bonus points.

After every two sheets you'll get an extra life and an attempt at the challenge stage. Here you have 99 units of time to turn the four junkies into stormer — if you succeed you'll get 8000 points! Below your score is shown the number of satellites left to collect, together with the number of lives left.

Pressing F7 will freeze the game and pressing the Space-Bar will restart it. Tape copies of the program are available for £3.25 from Nalin Sharma, 35 Kitchener Road, Walthamstow, London E17 4LJ.

```
note: enter letters as
capitals
5450: 46a90f3d08d86d09 301
5458: d00d24d88d25d8a9 494
5460: 168d33048c44048d 23c
5468: 5b048d6c04a9078d 299
5470: 33d88d44d88d5cd8 474
5478: 3d6cd8a90e8d5204 36c
5480: 8d6e04a9043dfad8 374
5488: 8d52d8a90f8d5804 358
5490: 8d7404a9048d74d8 38b
5498: 8d56d8a5290d5904 375
54a0: a52a8d7504a9038d 30e
54a8: 75d89d59d8207e46 3ef
54b0: 207e46207e46a90f 280
54b8: 8d0070a914205846 278
54c0: a9158d83048d9434 2f7
54c8: a9298d8a04a92a8d 34d
54d0: 8c048d8c04a92b8d 30d
54d8: 8d0470a654a62f20 322
54e0: e654c62f206544c0 35b
54e8: a200661aa002a52f 2b8
54f0: c900f004a204a01e 321
54f8: b51b434a4a4a4a59 2d9
5500: 2804a9019926d868 2d7
5508: c8c90f992804a901 26f
5510: 9928d8c8e8e61aa5 4ee
5518: 1ac904d0dba200a0 344
5520: 03a52fc900f004a2 336
5528: 01a01fb527484a4a 278
5530: 4a4a955004a20399 2c6
5538: 50d868290f995104 2b6
5540: a9039951d860a200 370
5548: a52fc90df002a204 335
5550: f818b51e652e951e 329
5558: b51d652d951db51c 2e7
5560: 652c951cb51b652b 2a2
5568: 951bd8a900852b85 366
5570: 2c852d852e60a200 200
5578: c1059107e6c8e003 3e1
5580: d0f660a200b10591 40f
5588: 07e088d003d0f660 482
5590: a200a41220bd47e8 374
5598: c8e028d0f76020da 4f1
55a0: 44a5fa8d1370a901 3a1
55a8: a2006e1d089d27d0 3c1
55b0: e0e003d0f8a5be23 51f
55b8: f356a9ff8d15d0a9 58c
55c0: 553d01d08d03d08a 3a0
55c8: 05d0a9856d07d08d 3f4
55d0: 09d0a9b58d0bd08d 42c
55d8: 0dd08d0fd0a97c8d 3fb
55e0: 00d08c86d28d0ad0 35a
55e8: e0ac8d02d38d0cdc 41d
55f0: a9cc8d04d08d08dc 44b
55f8: 8d0ed0a9818d1670 3a3
5600: a9a4851a20f356ad 402
5608: 1a701869198d1a70 23b
5610: a21420aa46c61aa5 34b
5618: 1ac99cd0e7e61aa2 4d8
5620: 3220aa46a209a006 293
5628: ec00d0ee01d0ee03 46e
5630: d0ce04d0ee05d0ee 523
5638: 06d0ce08d0ee0ad0 444
5640: ce0bd0ce0dd0ce0e 430
5648: d0ce0fd098488a48 42f
5650: 20aa4668aa68a8ad 3df
5658: 03d0c985f01fad13 3f0
5660: 7038e9058d137088 32e
5668: f000d0bca006c18a 446
5670: 48e61aa51a20f356 370
5678: 68aa4c285620da44 31a
5680: a2008d1670a9078d 379
5688: 1dd0a9888d02d0a9 426
5690: b88d04d0a9848d03 3d6
5698: d08d05d08d01d0a9 439
56a0: a08d00d0a99e8d27 368
56a8: d08d28d08d29d0a9 484
56b0: 90a0cd201a492052 2f2
56b8: 49a990a0be201a49 373
56c0: 205249a0ff8d15d0 395
56c8: a2008a48a9cc2009 312
56d0: 49207c4aa9cc2009 2cf
56d8: 4920be4aa20a20aa 2df
56e0: 4658aae8e00cd0e2 4de
56e8: a9908df007a9018d 34c
56f0: 15d060a2009df807 383
56f8: e8e008d0f860ad00 425
5700: dc29148531a53129 2c9
5708: 01c900d00ead01d0 325
5710: c952f005ce01d0ce 47e
5718: 01d0a5312902c900 29b
5720: d00dad01d029bef0 40c
5728: 06ee31d0ee01d0a5 429
5730: 312904c900d045a5 2e1
5738: 11c901f007e630e6 30e
5740: 324c6057c630c630 31f
5748: a530290ec900d0e7 3fe
5750: a9008530a90285c1 29f
5758: a992cdf0074c6a57 3d4
5760: a5302920b920d002 2d9
5768: 8530a530460a18e9 25d
5770: a08d00d0684a4a65 37e
5778: 1e4cc957a5312908 233
5780: c900d045a511c902 35f
5788: f007e630e6304cad 41c
5790: 57c630c630a53029 341
5798: 80c900d0cda90085 494
57a0: 30a9018511a99004 336
57a8: f0074cb757a53029 357
57b0: 20c920d002853006 296
57b8: 30a9e008e0300d00 333
57c0: d04630a5304a4a65 334
57c8: 18e5312918c900d0 2b3
57d0: 1fa034c901f060a2 3b4
57d8: 01a002ad15d02902 260
57e0: c902d01e8c08c8ad 4d
57e8: 15d02904c904d005 2b4
57f0: a900853460900d15 27c
57f8: d08d15c0adf0074a 438
5800: c948d00da9009559 385
5808: ad00d018692c4c1b 291
5810: 58a9019959ad00d0 36d
5818: 38e514488a0aaa68 323
5820: 5d00d0e8ad01d09d 470
5828: 00d09849ff2d10d0 3bd
5830: 9d10d0a901853460 330
5838: a234a90085309509 2c0
5840: e8e08cd0f9a9043d 557
5848: 28d08d25d0a9018d 3b5
5850: 15d00d1dd0851185 37a
5858: 54855585568557a5 38b
5860: 2fb52338a9014aa8 31b
5868: c9fdeb8d6f52a201 412
5870: a52fc900f002a21d 34e
5878: a9dd9d28049d3104 32c
5880: a9049d28d09d31d8 3f0
5888: a9948df0b078df07 45c
5890: 8df4078df407a964 430
5898: 353885f9a99e853a 375
58a0: 353ba9e2854ca903 2e8
58a8: 854da9e5854ea906 302
58b0: 054fa9058de70320 319
58b8: e76ea200bd176c9d 3c6
58c0: 0470a9039d3803e8 2dd
58c8: e019d0f360a564c9 4f6
58d0: e1d0362006612051 1cf
58d8: e160a56fc901d009 37e
58e0: 20a861201f622032 21c
58e8: 6360a56fc901d018 389
58f0: 20495c20fe5020cf 32a
58f8: 5920a15a20135f20 223
5900: 6d5b20e65f20ea63 39a
5908: 60a5efc901f00160 38f
5910: a612208959a612ca 33c
5918: 202f5960a56fc901 2e6
5920: f00160a612208959 30b
5928: a612e3202f5960a0 348
5930: ffca08e08a2907c9 4fc
5938: 00d0f78a4a4a4aaa 3d9
5940: 8a291fa62fe000f0 377
5948: 023020aa48bd00c2 2fc
5950: c930f02848290f0a 26b
5958: aabde668856dbde7 54b
5960: 68856e684a4a4a4a 2eb
5968: 481869db916d68aa 3c4
5970: a9d418656a5f6abd 418
5978: 05e9916d68aae69e 3fe
5980: 186908a8c02830b8 301
5988: 60a0ffcac0e0ca29 52c
5990: 07c900d0f78a4a4a 3b5
5998: 4aaa8a291fa62fe0 37b
59a0: 00f002092aa43bd 2ca
59a8: 00c2c900f0144329 300
59b0: 3f0aaabde668856d 3c4
59b8: bde768856e68a920 43c
59c0: 916d68aae8981069 411
59c8: 08a8c02830cc60ad 3a1
59d0: 1fdc2901c901f001 2d4
59d8: 60a200ad00d036e9 3a0
59e0: 184a4a4a48ad01d0 2bc
59e8: 38e952482007c905 2b9
59f0: 3002a201866c684a 279
59f8: 4a29feaabde68885 4ab
5a00: 69bde768856a684e 414
5a08: a820375ae8e8bdec 4c3
5a10: 688569bde768856a 451
5a18: 6848a820375ae8a8 319
5a20: a56cc901f00160e8 414
5a28: e8bde6688569bde7 58c
5a30: 68856a20375ae80a 2f2
5a38: 4888a900856bc8ec 417
5a40: 5ba56bc907f005b1 443
5a48: 69c920f0f138e9db 52f
5a50: 0a0a0a0a852e8d4e 1be
5a58: 03204655a9209169 281
5a60: 981865124a4a4aa6 2ab
5a68: 2fe000f003186920 2a3
5a70: aaa5009a00c2a62f 387
5a78: b527f033e9019527 3b2
5a80: c0aa3000c900f004 37d
5a88: c910d00fa9108d38 336
5a90: 03a918843963a900 236
5a98: 8d3a034c3e5a68aa 2c8
5aa0: 60a93c1865308d1a 299
5aa8: 70a9608d1370a981 3b3
5ab0: 8d1670ee3d03a921 30b
5ab8: 38e530cd3d03100d 277
5ac0: a9006d2d03adf807 322
5ac8: 49016df807a90285 306
5ad0: 75a9018576ad15d0 3ac
5ad8: 2575c575d05aa676 41a
5ae0: 8a0aa3b559c901f0 404
5ae8: 34b900d018690690 2d4
5af0: 0a48ad10d005758a 2e6
5af8: 10d0689900d0ad13 36e
5b00: d02575c575d001b9 45c
5b08: 00d029f8c960d028 412
5b10: a57549ff2d15d08d 4c1
5b18: 15d04c305b96aabd 3c3
5b20: 00d038e9059d00d0 364
5b28: 2948c900d00aa575 3da
5b30: 49ff2d15d08d15d0 3cc
5b38: e6760575a576c903 3be
5b40: d093ad15d02906c9 3ad
```

Available on Telsoft.


```
5b48: 00f021e652a552c0 409
5b50: 06d004a9003552aa 304
5b58: 186997ed9078d+a 42c
5b60: 37bd306c8d1373a9 31b
5b68: f08d1a7060a90385 39d
5b70: 71a9038570a670b5 3dd
5b78: 612901c901d00620 24b
5b80: 525e4c665cb56129 2fd
5b88: 40c940a00620a25d 33e
5b90: 4c665cb56129040c9 31a
5b98: 04f00bd65:b551c9 3f5
5ba0: 00c00320/45cb561 2d9
5ba8: 2908c908d00620ec 2e3
5bb0: 5d4c665cf5596558 3c8
5bb8: 48290f8572684a4a 273
5bc0: 4a4ac504d004a900 2ce
5bc8: 955916757baand52 3af
5bd0: 6a0a0a0a0a185572 181
5bd8: aabd5269a6704829 3a9
5be0: 0718758385726840 2be
5be8: 2908c908f012b541 2fa
5bf0: 18657295416549c9 32c
5bf8: 00290795494c0f5c 1c5
5c00: b54138e5729541b5 410
5c08: 45e9032907954968 2a8
5c10: 4a4a4a4a48290785 225
5c18: 72682908c908f014 2e0
5c20: b5351065729857229 2f9
5c28: fcc9b4f02ea57295 543
5c30: 354c455db53538e5 329
5c38: 7285722f9fccdb0f0 497
5c40: 1aa5729535a670b5 3c6
5c48: 612904c904d017b5 2f7
5c50: 51a8b53529fcd912 3f3
5c58: 0bd00ba670b56129 39b
5c60: f09561209a5ce670 45d
5c68: 0671a570c907f003 34f
5c70: 4c755b60b5610904 29f
5c78: 29b/9561ad.bd429 39b
5c80: 079551a3b5353ef9 3b0
5c88: 126bb007a938957b 325
5c90: 4cb15ca930957b4c 38e
5c98: b15cb56129304a4a 310
5ca0: 4a4aaa20f35ca670 3c3
5ca8: ad1bd4290f155195 2cf
5cb0: 51a9ff9559a62fb5 471
5cb8: 2338e9010a0a0a85 1c6
5cc0: 72ad1bd425070572 2b5
5cc8: a8a62fb525187392 37a
5cd0: 6aa6709583a54138 3b6
5cd8: f541a549f549b006 418
5ce0: b57c0904957ba533 325
5ce8: c901d006b57b4904 31d
5cf0: 957b60ad1bd44a4a 3a0
5cf8: a0c8a533c901f00c 40e
5d00: a5712d15d0c571d0 42a
5d08: 034c905d93dd206b 33b
5d10: 100/a900a2604c9a 2c6
5d18: 5ddd236b1007a900 290
5d20: a0004c9a5ddd266b 3c1
5d28: 1007a910a0f04c9a 346
5d30: 5d4d296b1007a918 2a6
5d38: a0f04c9a5ddd2c6b 447
5d40: 1007a920a0f04c9a 356
5d48: 5ddd2f6b1007a923 2bc
5d50: a0c04c9a5da533c3 444
5d58: 01f0f398cd325b10 486
5d60: 2fa670b561094095 339
5d68: 61a54:9541a54995 3a0
5d70: 49a93f93518a1003 322
5d78: d848a8a9be201a49 3b2
5d80: 205249a67069d9f8 3ce
5d88: 07686368684c665c 2c5
5d90: a670b56109089561 333
5d98: a000a670957b9895 473
5da0: 5160b551488a1869 30a
5da8: d8a8a994201a4968 3a8
5db0: a0200355a6709895 3e3
5db8: 514a4aaaad3b03c9 343
5dc0: 02f00ba5048d3b03 275
5dc8: bd8e6cbd0570a670 3cf
5dd0: b551c900d0148d3b 37b
5dd8: 03b56129bb090895 2a3
5de0: 61a99494f807a900 463
5de8: 555150b56129304a 2ff
5df0: 4a4a4a8572a5194a 2d4
5df8: 1865728572e672a5 3e3
5e00: 4138f541a549f549 3db
5e08: b012b54138e57295 3dc
5e10: 41b549e900290795 2ed
5e18: 494c2b5eb5411865 291
5e20: 729541b549590029 2d8
5e28: 379549a535d535f0 3b9
5e30: 17f535900bb535c9 38f
5e38: b4f00df6354c435e 3ce
5e40: b535c952f002d535 402
5e48: 60a9b8200c49205c 2c1
5e50: 4962b5612902c902 2b5
5e58: f048a9c89df807f6 53b
5e60: 51a9023d3b03b551 2cd
5e68: 290fa8c97e6c8d05 315
5e70: 70b56129304a4a4a 2bd
5e78: 4aa8b91a6bd551d0 426
5e80: 20a9008d3c039d34 26e
5e88: 03b5612933186910 283
5e90: 29309561a9949df8 421
5e98: 07a9019551a9ff95 3c4
5ea0: 5960b559c910f030 3c0
5ea8: f659b5594a8572a9 447
5eb0: a438e5729df807b5 484
5eb8: 59c90fd01a4659a9 413
5ec0: 0095518a1869d848 311
5ec8: a8a99420'a492052 2a3
5ed0: 45a670689df80760 3c3
5ed8: b551488a1869d8a8 3a9
5ee0: a994201a4968a020 2f0
5ee8: 7655a670989551ad 40c
5ef0: 3b03c902f010b551 30f
5ef8: 4a4aa8b99e6c8d05 391
5f00: 70a9038d3b03b551 2ed
5f08: c93fd0034c815e60 366
5f10: ea3c03a5008570a5 378
5f18: 1238e9030a26783a 1e8
5f20: 26700a267938e50f 272
5f28: 8577a578e9002907 332
5f30: 8578a577186d00d0 36e
5f38: 8541a5786b002907 27c
5f40: 8549ad01d0853560 366
5f48: a676b54138e57785 42b
5f50: 79b549e578290785 389
5f58: 7aa95738e579a901 3ba
5f60: c57a9095b535488a 400
5f68: 0aaae8689d00d0ad 41e
5f70: 3b03c902101ba201 1de
5f78: 8d3b03ac3c032903 1e3
5f80: a8b9ae6c8d0570bd 43a
5f88: 00d038e9500a8d05 2de
5f90: 79caad15d005759d 3d3
5f98: 15d0a5799d00d0a5 415
5fa0: 7ac901d009ad10d0 3aa
5fa8: 05759d10d060a575 361
5fb0: 49ff2d10d00d10d0 3c2
5fb8: 60a57ac9ffd01ca5 4d8
5fc0: 7938e9e390:5aca6 479
5fc8: 02cc00f007a57938 30f
5fd0: e9068579a901857a 398
5fd8: 4c645fa57549ff2d 39e
5fe0: 15d08d15d050a908 368
5fe8: 8575a203867620f4 3af
5ff0: 6220485f0675e676 30e
5ff8: a20420f46220435f 2e3
6000: 3675e676a20520f4 392
6008: 6220485f0675e676 300
6010: a20520f46220485f 2e5
6018: a574c901d0070675 335
6020: e67620485f60b561 399
6028: 29304a4a4a4aa8b9 2e2
6030: 39fb8540b54108e5 37b
6038: 77853db549e57825 3bd
6040: 07853e063d263e06 177
6048: 3d263e063d200ea5 1cd
6050: 3e18691b293f853a 205
6058: 2903186543a8a53a 274
6060: 293c0a853eb53538 254
6068: e94f4a4a4a853fa5 383
6070: 008540a53f2908c9 2a3
6078: 08f00ba90b8d9860 33c
6080: 8d9e604c6e60a90f 37d
6088: 0d98608a9e60a53f 344
6090: 290719653eabd03 2d2
6098: 0b190a699d860be5 2a5
60a0: 3fc8c8c8c8e640a5 52a
60a8: 40c903d0c660a200 3a4
60b0: a924203260a20320 244
60b8: 2660a204202660a2 274
60c0: 05202660a2062026 199
60c8: 60a574c901d007a2 3bc
60d0: 07a930203260a2 294
60d8: 00a9009d800c9d80 2ee
60e0: 0fe8e08ed0f5c020 49c
60e8: d760a200a070969d 41e
60f0: 340409809d5c04a9 267
60f8: 099d34d09d5cd8e8 46b
6100: c8c030d0e960ad38 506
6108: 03c900f038ad3a03 2de
6110: 290f0d380338e910 1b1
6118: aabd366c8d0c70ad 3bf
6120: 3a03c903d013ac38 2ce
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6130: 7a6c8d0f70ae3a03 31d
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7088: 8bd01967c0106cce 3de
7090: 35a31793159c3ced 33f
7098: 7220d89c6b462f25 38b
70a0: 2a3f649ae334b138 372
70a8: d68d5a4b557ec834 3db
70b0: c67f616fac7ebc95 490
70b8: a9fca169cfec2df 5da
70c0: 5834782b53f71fd2 36a
70c8: 19fc85bdb067ff00 46d
70d0: 0000000101010101 005
70d8: 0101010101010202 00a
70e0: 0202020202030303 013
70e8: 0303040404040505 02c
70f0: 0506060607070808 035
70f8: 09090a0a0b0c0c0d 056
7100: 0e0f101112131415 08c
7108: 1618191c1c1e2022 0de
7110: 2426282b2d303336 163
7118: 393d4044484c5156 235
7120: 5b60566c737a8189 384
7128: 9199a3acb7c1cdd0 597
7130: e5f4ff0000000000 2d9
7138: 3135313531353130 193
7140: 2e3031302e303130 17e
7148: 2e3031302e333130 17e
7150: 00302c0030003133 0f0
7158: 3133313331333133 190
7160: 3133313135000035 130
7168: 3100003335000035 0ce
7170: 3333000033353500 133
7178: 0033353335000031 131
7180: 3133300000333331 12e
7188: 3100003135350031 0fd
7190: 3535313131333535 19a
7198: 3531333535313133 198
71a0: 3531313531313333 194
71a8: 3335353331313333 198
71b0: 3535313333333535 15e
71b8: 3133333335310031 161
71c0: 3335333133350031 195
71c8: 3335333133350331 193
71d0: 3335333133353331 198
71d8: 3333333133353331 198
71e0: 3531353135313531 198
71e8: 3531353135313531 198
71f0: 3531353135313531 19e
71f8: 3531353135313531 198
7200: 3531353135313531 198
7208: 3531353135313531 198
7210: 3533353335333533 1a0
7218: 31313335362e2e2e 18a
7220: 2e31353335333533 197
7228: 353331313335362e 196
7230: 2e2e2e3135333533 18b
7238: 3533353331313335 19a
7240: 362e30312e303131 185
7248: 3533353335333533 1a0
7250: 31313335362e2e2e 18a
7258: 2e31353335333533 197
7260: 353331313335362e 196
7268: 2e2e2e3135333533 18b
7270: 3533353331313335 19a
7278: 362e30312e303131 185
7280: 3538383835383538 1b7
7288: 3838383538353833 1ba
7290: 3838353831353838 1b3
7298: 3135383838353835 1b0
72a0: 3838383835383538 1ba
72a8: 3838383538313538 1b3
72b0: 3831353838383538 1b3
72b8: 3538383833353835 1b7
72c0: 3838383835383135 1b3
72c8: 3838313538383835 1b3
72d0: 3835383838383538 1ba
72d8: 3538383838353831 1b3
72e0: 3533383133313331 19e
72e8: 3331333133313331 190
72f0: 3331333133313331 190
72f8: 3331333133313331 190
7300: 3331333133313331 190
7308: 3331333133313331 190
7310: 3331333133353631 197
7318: 3335363133353e3d 1aa
7320: 0061ff00ff00ff7f 3dd
```

To be continued.

TOP★ TIPS

RESPONSE Frame

Do you have a problem related to your micro? Tim Hartnell will do his best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

VDU 19 FOR CBM-64

This routine for the CBM-64 simulates the BBC's VDU 19 function. It changes all the text and graphics characters in a given colour to another colour specified by the user. Although the Basic loader program Pokes the routine into memory from address 49152 onwards it is relocatable.

To call the routine use SYS (address) x,y where the address is the start address — in this case 49152 — x is the colour to be searched for, and y is the colour to replace it. x and y are the colour numbers as given in the User Guide.

David Rocke.

```
30 CLEAR 64720: LET t=0: FOR n
=64721 TO 64765: READ i: POKE n,
i: LET t=t+i: NEXT n
 40 DATA 33,0,61,17,0,253,1,0,3
,237,176,[illegible]
 41 DATA 126,31,119,35,126,31,1
19,35,126,31,119,35,35,35
 42 DATA 126,23,119,35,126,23,1
19,35,126,23,119,35,16,228,201
 45 IF t<>3633 THEN PRINT "Erro
r in DATA": STOP
 50 RANDOMIZE USR 64721
 60 PRINT "Lines 30 TO 50 can b
e deleted"
9000 INPUT "Italic or Normal Pri
nt (I/N)?";i$
9010 [illegible]
```

ROMAN TO ITALIC

The short machine code program listed below is for a 48K Spectrum. When run it allows an alternative character set to be called from within a Basic program. Printing can be switched at any time from normal to Italic and back.

The Basic program can be saved in the normal way or alternatively once run the basic program can be deleted and the code saved as follows:

SAVE "ITALICS" CODE 64768,768

remembering to

CLEAR 64767

before re-loading.

T Walmsley.

```
10 T=49152
20 FORP=1TO10:[illegible]
30 IF S=-1 THEN 80
40 POKET,S:CS=CS+S*2:T=T+1:NEXT
80 READC:IFC=CSANDS<>-1THENCS=0:
[illegible]
95 IFS=-1THENEND
100 PRINT"ERROR IN DATA IN LINE"
,PEEK(63)+256*PEEK(64) END
200 DATA32,138,173,32,247,183,16
5,20,41,15,2092
210 DATA133,253,32,253,174,32,13
8,173,32,247,2934
220 DATA183,165,20,41,15,133,254
,169,0,133,2226
230 DATA251,169,216,133,252,160,
0,177,251,41,3330
240 DATA15,197,253,240,24,160,1,
24,181,251,2550
250 DATA133,251,169,0,101,252,13
3,252,201,219,3422
260 DATA208,231,165,251,201,212,
208,225,36,165,1964
270 DATA254,145,251,161,0,240,22
4,-1,2363
```

BBC ORGAN?

I have little knowledge of electronics, but I would like to be able to connect my organ up to a BBC Micro Model B to achieve computer-controlled music using a combination of hardware and software. The organ is about 10 years old, and was made at a time when home computers had barely been thought of. It has no ports of any kind. Can you help?

Jason Phillips,
Halfway,
Sheerness.

UNFORTUNATELY, I can't. The age of the organ suggests it is almost certainly an analogue device, so interfacing it with a digital device is not possible. It is likely that inside the organ is a vast set of switches, one per key, which trigger particular little circuits for each note. The organ is therefore totally hardware dependent.

SPECTRUM BLUES

About 10 months ago I got a 48K Spectrum. Ever since I got it, I have been having problems with its memory. When I turn it off, after putting in a large program, I have to leave it for about 10 minutes before loading in another program. If I don't, the computer simply says "out of memory" half way through loading another program. My friend's 48K Spectrum works perfectly. What should I do about it?

Jason Wallace,
Marondera,
Zimbabwe.

SEND IT back to Clive quickly, or his representative in your country, before the warranty runs out.

CBM-64 GRAPHICS

I am the owner of a Commodore 64, and would be grateful for information concerning graphic programs for my computer. All the programs and utilities that I have seen, or typed in myself, have been very slow and lacking in sophistication. They seem mostly to be a single colour background and pen, and without many of the professional computer art necessities. Are there any drawing utilities available for the 64 that incorporate some of the features mentioned?

David Warren,
Hazlemere,
High Wycombe.

THERE ARE a number of such products available. From those available on disc, Quicksilva's Doodle seems to be the strongest, while the cassette Pix-Stix comes complete with a light pen. You might also wish to investigate the Koala Touchpad.

VERIFY BUG

I own a 48K Spectrum which has worked (almost) perfectly for over a year. Recently, however, when saving programs on tape, I have been unable to get them to verify, as the message "Tape loading error" appears. It is the same with any tape. Is there something wrong with the computer or the tape recorder, which is only three months old?

James Hickling,
Canterbury.

YOU DO NOT say if despite the inability to verify your programs, they will load back in. You also do not say whether or not the problem began when you first hooked in your new cassette recorder.

I would suggest that, if you've followed all the ordinary precautions of clean heads, proper computer tapes, and making sure the load/save leads do not twist around things like the power supply lead, you should find the computer loads and saves quite happily, despite your inability to verify.

If it does not, and it does not work with *another* cassette recorder, the problem is almost certainly the computer.

STOP THE FLICKER

I have a BBC model B. I find that the best I can do to get smooth action graphics is illustrated in this cut-down program:

```
10 MODE 2
20 X=640:Y=512: VDU 5:GCOL
3,3
30 REPEAT
40 MOVE X,Y
50 *FX 19
60 VDU 65
70 X=X+2:Y=Y+2
80 UNTIL Y>1000
```

It is not the speed of the character which concerns me, but the flashing of it. I have found that line 50 helps to an extent, but I find I cannot improve on this. I have also written the program in machine code and see no difference. Is it the slow VDU drivers? Or have I gone as far as I can?

Stephen Blears,
Bowdon,
Cheshire.

I CANNOT SEE how this program will, in fact, produce 'moving graphics'. All you get with the listing you've given me is an 'A' plotted over and over again in slightly different positions, leaving the "old" A still on the screen.

There is nothing in this program to "flash" which suggests to me that you have a CLS in your original program, probably as line 55, before the "new" A is printed. The *FX 19 causes the display to wait until the next frame which would tend to stabilise your picture slightly.

A far better way to get "moving graphics" of this type would be to set up two additional variables — such as X1 and Y1 — which hold the position of the A *before* it is updated. Then, in line 55, do a VDU 32 after moving to X1, Y1. Follow a Move X,Y with your VDU 65, then — before you increment the values of X and Y, set X1 equal to X and Y1 equal to Y. This will produce an 'A' which moves very smoothly, without flicker.

COMPILER

It is possible to buy a compiler that is able to translate *all* Basic into machine code? If so, which one is suitable? This is to use with Spectrum programs.

R Bruce,
Aberdeen.

THERE ARE no Spectrum compilers on the market, that I know of, which can cope with all of Spectrum Basic. For example, Softek's FP-Compiler, which is one of the best ones I've ever used, does not cater for string arrays, which makes it almost impossible to use for adventure programs. However, apart from that, it appears able to handle all of Spectrum Basic.

SOFTWARE *File*

Programs for Software File should be fairly compact and sent on a cassette. Please include clear instructions and say what computer it's for. We pay between £6 and £36 for programs published. They must be double-checked and submitted

Nuclear Tomatoes

David Green,
Ashford,
Kent.

Spectrum

THIS IS A fast machine code game for the Spectrum with weird sound effects but, most importantly, it is not very long. You should be able to type in the 1K of machine code within an hour without suffering any ill effects on your eyesight. The game itself is based around the utterly ludicrous premise that by the end of the 20th century, the main source of atomic power will be the heavy element Spectrum 428, found in very small quantities in tomatoes.

Unfortunately, by this time a few small genetic engineering errors have made all vegetables considerably more intelligent than they were before, and the following speech, made by the leading vegetable rights campaigner Heinz Tomato, shows some of the problems caused by this:

"Friends, tomatoes and other vegetables, lend me your ears, for I have come to bury these humans, not to praise them. After all, some men are born tomatoes, some achieve tomatoes, and some have tomatoes thrust upon them. Whether 'tis nobler in the mind to suffer the slings and arrows of outrageous fortune, or 'tis better to stay at home and watch the television? If you prick us, do we not bleed? If you poison us, do we not die? And if you put us in the fuel cores of nuclear reactors shall we not jump up and down a lot and make them explode?

"We will fight them on the beaches, we will fight them in the frozen food department of Marks and Spencers, we will fight them in large square buildings belonging to the CEGB, we will fight them in the cracks in the pavement, and future generations will remember us, and say: 'Never in the field of vegetable conflict was so much owed by so many to a bunch of tomatoes'. Or something like that, anyway."

Your job is therefore to move the boron blocks in the nuclear reactor up and down to absorb the fanatical tomatoes, since if too many of them hit the unshielded walls on the left and right, the reactor's temperature will get so high that it will melt down, and you should obviously try to prevent this sort of thing.

The game is in three sections, a short Basic loader which prints up the title screen and defines the graphics, the machine code which controls the actual game, and a longer Basic program which does everything else. If anyone out there has still got a 16K Spectrum, then this program should work on it, but I'm not sure since I haven't been able to test it. All you have to do, therefore, is type in listing 1 and save it, enter the machine code in listing 2 using the hexloader in listing 3 and save that, and then type in the last section shown in listing 4, saving it right after the other two bits. Then rewind the tape, load the whole thing again, and, in the words of a certain well-known software company, play the game.

Listing 1.

```
  10 REM Nuclear tomatoes loader
  20 REM ===========================
  30 REM      © D.Green 1985
  40 REM
  50 INK 7: PAPER 0: BORDER 0: C
LEAR 29998
  60 DATA 84,56,116,250,254,254,
124,0
  70 RESTORE : FOR n=0 TO 7: REA
D a: POKE USR "a"+n,a: NEXT n
  80 FOR n=0 TO 7 STEP 2: POKE U
SR "b"+n,170: POKE USR "b"+n+1,8
5: NEXT n
  90 FOR n=USR "t" TO USR "t"+7:
 POKE n,254: NEXT n
 100 FOR n=USR "u" TO USR "u"+7:
 POKE n,127: NEXT n
 110 LET a$="\\REACTOR\\SAVED\\"
 120 FOR n=1 TO LEN a$: POKE 319
99+n,CODE a$(n)-65: NEXT n
 130 POKE 31999-n,42
 140 REM Now you should set up
        the UDG's by typing RUN

 150 PRINT '"
 NUCLE
 160 PRINT '"
 TOMAT
 'OES
 170 PRINT AT 14,0;"  ©'85  H.
 IGH                          TI
 ECH"
 180 REM Line 150 reads:
     U88TU  TU88TU U88TU88TU88T
     U  IU  IU   U U  T   TU
     (all in graphics mode)
     and so on...
 190 REM Line 160 reads:
     U8TJ8TU888TU8TU8TU8TU8IU8
      8 J TU 8 TU T 8 U TU  U
     and so on...
 200 REM Line 170 reads:
   3  01300200035 55
   3338  8  8 3854375 etc
   (all in graphics mode,with
    CAPS SHIFT in the all of the
    right places)
 210 PRINT AT 21,2;"Design & sof
tware by D.Green"
 220 INK 0: PRINT AT 12,0
 230 LOAD ""CODE : PRINT AT 12,0
;: LOAD ""
 240 REM
        SAVE "nuclear" LINE 0
```

Listing 2.

```
30500: C5D521004073E618 = 881
30508: B4677SE61F6F78E6 = 1126
30516: 07CB27CB27CB27CB = 936
30524: 27CB27B56FD1C1C9 = 1176
30532: C5D5E52A4757FA0C = 1027
30540: FE0A220536002B18 = 422
30548: F577050521347SC5 = 774
30556: E57E11800D070707 = 532
30564: E7A35F3F00AA573F = 753
30572: 09604F0614CD2477 = 602
30580: 05081A77132410FA = 480
30588: E1EBC110DAE1D1C1 = 1322
30596: C9E52A4079237CFE = 1066
30604: 3720072A785C7CE6 = 702
30612: 1FE722407S7EE1C9 = 901
30620: C5C5D5E5CDB503E1 = 1450
30628: D1C1D370FEFF2002 = 1112
30636: 26011DEDC1C9C5C5 = 1080
30644: D5E5CDB503E1D1C1 = 1458
30652: 2310F4C1C9210004 = 726
30660: 1101000CFFCD9C77 = 759
30668: 0605210002110300 = 65
30676: C50620CDB277C110 = 946
30684: F10602CDB2772135 = 835
30692: 75360423360900 3E = 335
30700: 3F323775AF000000 = 460
30708: 0000002.A65A2209 = 380
30716: 7521307506057723 = 480
30724: 10FC3A3575328150 = 767
30732: 3A3675472144750E = 532
30740: 0ECC79FE1120030E = 457
30748: 0F04E5CD2477C5ED = 1042
30756: 5B7B5206081A7713 = 484
30764: 2410FAC1E1712370 = 980
30772: 2336002336002305 = 410
30780: E511140026036BCD = 616
30788: B5C3E1C13A815C3D = 942
30796: 32815C0720C3AF32 = 906
30804: 3B75210309223C75 = 432
30812: 211C09223E752100 = 316
30820: 37CD8577061E261F = 617
30828: 110A00CD85776FC5 = 792
30836: E5CDB503E1C12510 = 1009
30844: EFC3B478C5CD2477 = 1291
30852: 06083500241 0FBC1 = 554
30860: C504CD2477060836 = 629
30868: 002410FBC1C9C5CD = 1099
30876: 2477060836 5A2410 = 355
30884: FBC1C504CD247706 = 1011
30892: 08365A2410FBC1C9 = 849
30900: ED4B3C75CD80783E = 1004
30908: F7DBFECB47200405 = 1035
30916: 2001043EFBDBFECB = 1026
30924: 4720070478FE1220 = 538
30932: 0105ED433C75CD9A = 846
30940: 78ED4B3E75CD8078 = 1064
30948: 3EEFDBFECB472004 = 1084
30956: 05200104 3EDFDBFE = 800
30964: CB4F20070478FE12 = 717
30972: 200105ED433E75CD = 726
30980: 9A78219802224275 = 676
30988: 2144753A357547C5 = 714
30996: E54E2345235E2356 = 652
31004: 7AFE80CADD79B7C2 = 1425
31012: 40793A377567CD85 = 858
31020: 77A4FE0102DD7916 = 1096
31028: FFCD8577CB472002 = 1220
31036: 16011EFFCB4F2002 = 524
31044: 1E01215801224275 = 370
31052: C5CD2477050836 00 = 625
31060: 2410FBC173824779 = 938
31068: 834FCD24777EB7CA = 1081
31076: CA797852477 9934F = 1007
31084: 7EFE54200FAF9257 = 919
31092: AF935F2180012242 = 679
31100: 753CA79FEFF200C = 1186
31108: AF9257218001 2242 = 670
31116: 753CA79FE5A201C = 1039
31124: 1630212102224275 = 403
31132: CD44773A33753C32 = 736
31140: 3B75213575BECA28 = 811
31148: 7A33DD79AF935F21 = 1109
31156: 0102224275 2A3975 = 436
31164: 3607232233753617 = 381
31172: 7DFEBFCAE37ACD24 = 1367
31180: 7725D5ED53785C06 = 1078
31188: 081A77132410FAD1 = 683
31196: C1E171E37AP37323 = 863
31204: 7223C1C5C2137901 = 682
31212: 16002A42 75C5E521 = 706
31220: 0100110100CDB503 = 408
31228: E1E52B7CB520FBE1 = 1310
31236: C10B78E120E7C3B4 = 1139
31244: 78116030DC3E27A07 = 886
31252: 07D7E7E35F3E008A = 623
31260: 5725060E81A772413 = 408
31268: 10FAC1C9C1C12100 = 1079
31276: 7D0107097EE5C511 = 711
```

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```
31284: 083ECD107A002100 = 446
31292: 0411140000CD50001 = 620
31300: 0CE1237EFE2A20E5 = 955
31308: 2A39753607233627 = 405
31316: E526010614110300 = 314
31324: CD9C77CD44772D44 = 1140
31332: 77E17DFEBF20E436 = 1228
31340: 07060021FF0F1101 = 334
31348: 00CD9C7701010100 = 588
31356: 2477C50606360024 = 455
31364: 10FBC10C79FE1F20 = 910
31372: EE0E010478FE1320 = 562
31380: E63A37758673C1F1F = 765
31388: 003D323775201436 = 397
31396: 3F3237753A3575C6 = 711
31404: 0432357530357530 = 514
31412: 3236753A2F753CFE = 757
31420: 0A20083A3573DC32 = 391
31428: 3875AF322F75011B = 590
31436: 14CD0D7A0D3A3875 = 604
31444: CD0D7A21A65A3617 = 706
31452: 223975C30678F5CD = 979
31460: 2477F1C9C1C12601 = 1022
31468: 0614110100CD8577 = 501
31476: 5F3P4A5C5E5CD08 = 964
31484: 7BE1C110ED247CFE = 1208
31492: 1420E5C9CDB50032 = 904
31500: 0058060300857716 = 575
31508: 005F1910F7CDA577 = 847
31516: 77C9FE2300000000 = 614
```

Listing 3.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))-CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 150 REM enter STOP to stop
```

Listing 4.

```
  60 REM
                  "Don't
                   save
                   them
                   for
                   the
                   salad"
  70 REM

     Graphics:A=a,B=b,T=t,U=u
  80 REM
  90 REM by.lef..23969(?!)
          (plt/ded)
 100 GO TO 460
 110 CLS
 120 PRINT INK 5;"[redacted]"
 130 FOR n=1 TO 18: PRINT INK 3;
"B"; INK 6;" "; INK 6;" "; INK
2;"                         "; IN
K 6;" "; INK 2;" "; INK 3;"B":
NEXT n
 140 PRINT INK 5;"[redacted]"
 150 PRINT TAB 4;"Score:0000000
Reactor:";INT (wv/10);wv-(INT (w
v/10)*10)
 160 PRINT "Temp.:"; PAPER 2;"."
; PAPER 0;"........................
...."
 170 DATA -8,-6,-5,-8,-4,-8,-3,-
4
 180 BEEP .2,-6
 190 FOR m=1 TO 2: RESTORE 170:
FOR n=1 TO 8
 200 READ a: BEEP .2,a: NEXT n
 210 NEXT m
 220 LET z=USR 30657
 230 BORDER 0
 240 LET sc=0: FOR n=2 TO 6: LET
sc=sc+PEEK (30006-n)*10^n: NEXT
n
 250 CLS
 260 PRINT TAB 2;"Reactor core "
;PEEK 30008;PEEK 29999;" melted
down    destroying everything wi
thin a    5 kilometre radius."
 270 PRINT '"You are awarded ";s
c;" points."
 280 PRINT AT 12,0;"OPTIONS:": F
OR n=1 TO 3: PRINT AT n*2+12,9;a
$(n);a(n);" ": NEXT n
 290 PRINT ' INVERSE 1;"Use 1 &
0 to change,O to select,
 and 0 to play.
 300 LET n=1
 310 PRINT AT 12,23;"WAVE:";3*((
a(3)/4)-1)+((a(2)+1)/2)-1;" "
 320 PRINT AT n*2+12,9; BRIGHT 1
;a$(n);a(n);" ": LET k$=INKEY$:
IF k$="" THEN GO TO 310
 330 PRINT AT n*2+12,9;a$(n);a(r
);" "
 340 IF k$="0" THEN GO TO 390
 350 IF k$="o" OR k$="O" THEN LE
T n=n+1-(3 AND n=3): BEEP .01,20
: GO TO 310
 360 IF k$="1" AND a(r)<u(r) THE
N LET a(n)=a(n)+s(n): BEEP .05,0
: GO TO 310
 370 IF (k$="q" OR k$="Q") AND a
(n)>l(r) THEN LET a(n)=a(n)-s(n)
: BEEP .05,-2: GO TO 310
 380 BEEP .01,-10: GO TO 310
 390 POKE 31212,32-a(1)
 400 POKE 30700,2↑(7-a(2))-1
 410 POKE 30691,a(3): POKE 30697
,10-a(3)/4
 420 LET wv=3*((a(3)/4)-1)+((a(2
)+1)/2)-1
 430 POKE 30008,INT (wv/10): POK
E 29999,wv-(INT (wv/10)*10)
 440 GO TO 110
 450 DATA "Speed:",20,16,2,2,30,
"Difficulty:",1,21,2,1,5,"Tomato
es:",4,19,4,4,36
 460 RESTORE 450: DIM a$(3,11):
DIM a(3): DIM c(3): DIM s(3): DI
M l(3): DIM u(3): FOR n=1 TO 3:
READ a$(r),a(r),c(n),s(n),l(n),u
(n): NEXT n
 470 GO SUB 530: CLS : INK 7: PR
INT AT 1,1; BRIGHT 1;"NUCLEAR TO
MATOES"
 480 PRINT '"Absorb the tomatoes
 threatening to destroy the nucl
ear reactor. Use keys:"
 490 PRINT AT 7,6;"Left block:";
AT 7,19;"Right block:"
 500 PRINT AT 9,0;"Up:";AT 9,9;"
(1)";AT 9,23;"(0)"
 510 PRINT AT 10,0;"Down:";AT 10
,9;"(Q)";AT 10,23;"(O)"
 520 GO TO 280
 530 REM tune © D.Green
 540 RESTORE 550
 550 DATA -8,7,11,-8,7,11
 560 DATA -8,7,12,-8,7,13
 570 DATA -8,7,12,-8,9,12
 580 DATA -8,8,13,-8,9,14
 590 DATA -8,11,16,-8,11,16
 600 DATA -8,11,19,-8,11,16
 610 DATA -8,11,11,-8,12,15
 620 DATA -8,11,14,-8,10,13
 630 DATA -8,9,12,-8,7,11
 640 DATA -8,7,11,-8,9,14
 650 DATA -8,9,11,-8,8,11
 660 DATA -5,7,11,-5,7,11
 670 DATA -8,7,11,-8,7,11
 680 DATA -8,7,11
 690 DATA -8,16,11,10,5,-1,-5
 700 FOR n=1 TO 27
 710 READ a,b,c
 720 BEEP .1,a-12: BEEP .1,b-12:
BEEP .1,c-12
 730 BEEP .1,a: BORDER 2: BEEP .
1,b: BORDER 0: BEEP .1,c
 740 IF INKEY$<>"" THEN RETURN
 750 BEEP .1,a-12: BEEP .1,b-12:
BEEP .1,c-12
 760 BEEP .1,a: BORDER 2: BEEP .
1,b: BORDER 0: BEEP .1,c
 770 IF INKEY$<>"" THEN RETURN
 780 NEXT n
 790 FOR n=7 TO 1 STEP -1: BORDE
R n: READ a: BEEP .1,a-12: BEEP
.1,a: NEXT n
 800 BORDER 0: BEEP .1,-20: BEEP
.4,-8
 810 RETURN
 820 REM          AAAAAAAA
                  ATHE ENDA
                  AAAAAAAA

 830 REM
         Save using
         SAVE "tomatoes" LINE 0
```

Graphics designer

Richard Hamer,
Reading,
Berkshire.

CBM-64

THIS USEFUL utility program written for the Commodore 64 allows the user to plot characters or sprites on an on-screen grid, and, at the touch of the button have the necessary data statements inserted into the program.

When the program has loaded, it will ask you for the starting address — enter the number of the line you want the first statement to appear in. The next thing the program does is enter the options page. You can do one of three things:

Pressing 1 will put you into sprite mode — there is a 24 by 21 grid for you to fill in, and the sprite is shown in the bottom right-hand corner. W moves you up — you can just see a square flicker as you pass it — A moves you left, D moves you right, X moves you down, and S fills in the square you are occupying. O returns you to the options page, destroying your sprite, N inserts the necessary data statements into the program, and M enters multi-colour mode.

In multi-colour mode, you can use three different colours, as described in the user's manual. The normal colour, white, cannot be changed, but the first and second multi-colours can, by pressing 1 or 2, depending on which you want to change. It is advisable to read about this in the manual first, and about the different bit patterns necessary to produce each colour, as it is rather complicated.

If you press 2 on the options page, you will enter the 8 by 8 character designer. This is much the same as the sprite editor, except that you are now working with normal 8 by 8 characters, and there is no multi-colour option here. Also, since it is necessary to switch over cases to view any user-defined characters, you must press P before you can see your character. Pressing any other key lets you use the designer again.

If you press 3 on the options page, the designer will erase itself, leaving only the data statements for your graphics. Before you can use them, you must, as always, poke them into memory. The designer is a great help since there will be no missed-out bits of data, resulting in Out of Data errors.

If you would like a copy of this program on tape, send a check/PO for £1.50 made out to R Hamer, to 26 St Barnabas Road, Emmer Green, Reading, Berkshire.

```
997 POKE53280,0:POKE53281,0:PRIN
T"          GRAPHICS DESIGNER
":FORT=1TO40:PRINT"_";:NEXT:PRIN
T
998 PRINT"DATA START ADDRESS";:
INPUTA:POKE50000,A/256:IFA>990TH
EN998
999 POKE50001,A-(INT(A/256)*256)

1000 POKE53280,0:POKE53281,0:PRI
NT"          GRAPHICS DESIGNE
R":FORT=1TO40:PRINT"_";:NEXT
1001 PRINT"MENU:":PRINT" 1.S
PRITES":PRINT" 2.CHARACTERS":PR
INT" 3.ERASE DESIGNER"
1002 PRINT"" A$="
":T=0:V=53248:POKEV+28,0
1003 T=T+1:IFT>15THENT=1
1004 PRINTMID$(A$,T,1)"  1 , 2 ,
 OR 3?":GETB$:V=VAL(B$):IFV<1OR
V>3THEN1003
1005 ONVGOTO1006,1059,1100
1006 PRINT"                  SPR
ITES":FORT=1TO40:PRINT"_";:NEXT
1007 PRINT"
 ":FORT=1TO21
1008 PRINT""T:TAB(4)"
 ":NEXT
1009 POKE2040,14:V=53248:POKE550
,255:FORT=896TO960:POKET,0:NEXT:
POKEV+21,1:POKEV+16,1
```

```
1010 POKEV,50:POKEV+1,200:X=0:Y=0
1011 PRINT"",,,"MULTI":PRINT,,,"1 COLOUR"
1012 PRINT,,,"2 COLOUR":PRINT,,,"NUMBERS":PRINT,,,"OPTIONS"
1013 GETA$:IFA$=""THEN1013
1014 IFA$="A"ORA$="W"ORA$="D"ORA$="X"ORA$="S"THEN1043
1015 IFA$="O"THENPOKEV,255:POKEV+28,0:GOTO1000
1016 IFA$="N"THEN1025
1017 IFA$<>"M"THEN1020
1018 P=PEEK(V+28):IFP=1THENPOKEV+28,0:GOTO1013
1019 POKEV+28,1:GOTO1013
1020 IFA$<>"1"ANDA$<>"2"THEN1013

1021 A=VAL(A$):P=PEEK(V+36+A)AND15:P=P+1:IFP<16THENPOKEV+36+A,POR240:GOTO1013
1022 POKEV+36+A,POR240:GOTO1013
1025 P=PEEK(50000)*256+PEEK(50001):POKEV+28,0:POKEV,255:PRINT"";
1028 PRINTP"D";:FORT=0TO9:PRINTPEEK(896+T)"II,";:NEXT:PRINTPEEK(906)
1029 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48:POKE637,51
1030 POKE638,49:POKE639,13:GOTO1041
1031 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(907+T)"II,";:NEXT:PRINTPEEK(917)
1032 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48:POKE637,51
1033 POKE638,52:POKE639,13:GOTO1041
1034 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(918+T)"II,";:NEXT:PRINTPEEK(928)
1035 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48:POKE637,51
1036 POKE638,55:POKE639,13:GOTO1041
1037 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(929+T)"II,";:NEXT:PRINTPEEK(939)
1038 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48:GOTO1052
1039 POKE638,48:POKE637,48:IFP>990THENPRINT"NO MORE AFTER THIS":FORT=1TO3000:NEXT
1040 POKE639,13
1041 P=PEEK(50001)+1:IFP>255THENPOKE50000,PEEK(50000)+1:P=0
1042 POKE50001,P:END
1043 X=X+(A$="A")-(A$="D"):Y=Y+(A$="W")-(A$="X"):IFX>23THENX=23
1044 IFX<0THENX=0
1045 IFY<0THENY=0
1046 IFY>20THENY=20
1047 Z=1140+X+Y*40:ZZ=PEEK(Z):YY=Y*3+INT(X/8)+896:IFA$="S"THEN1050
1048 IFZZ=160THENPOKEZ,76:POKEZ,160:POKEZ,76:POKEZ,160:GOTO1013
1049 POKEZ,160:POKEZ,76:POKEZ,160:POKEZ,76:GOTO1013
1050 IFZZ=160THENPOKEZ,76:POKEYY,PEEK(YY)AND255-(2↑(7-(X-INT(X/8)*8))):GOTO1013
1051 POKEZ,160:POKEYY,PEEK(YY)OR2↑(7-(X-INT(X/8)*8)):GOTO1013
1052 POKE637,53:POKE638,51:POKE639,13:GOTO1041
1053 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(940+T)"II,";:NEXT:PRINTPEEK(950)
1054 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48
1055 POKE637,53:POKE638,54:POKE639,13:GOTO1041
1056 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO7:PRINTPEEK(951+T)"II,";:NEXT:PRINTPEEK(959)
1057 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48
1058 GOTO1039
1059 PRINT"                    NORMAL CHARACTERS":FORT=1TO40:PRINT"_";:NEXT:PRINT
1060 PRINT"           ________:________":FORT=0TO7:PRINT""T;TAB(4)"LLLLLLLL:LLLLLLLL":NEXT
1061 FORT=0TO7:PRINT""T+8;TAB(4)"LLLLLLLL:LLLLLLLL":NEXT
1062 PRINT"",,,"NUMBERS":PRINT,,,"OPTIONS":FORT=14336TO15600:POKET,0:NEXT
1063 PRINT,,,"PICTURE":PRINT,,,"C"
1064 GETA$:IFA$=""THEN1064
1065 IFA$="A"ORA$="W"ORA$="D"ORA$="X"ORA$="S"THEN1082
1066 IFA$="O"THEN1000
1067 IFA$<>"N"THEN1091
1068 P=PEEK(50000)*256+PEEK(50001):PRINT"";
1069 PRINTPEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(14336+T)"II,";:NEXT:PRINTPEEK(14346)
1070 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48
1071 POKE637,55:POKE638,50:POKE639,13:GOTO1080
1072 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO9:PRINTPEEK(14347+T)"II,";:NEXT:PRINTPEEK(14357)
1073 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48
1074 POKE637,55:POKE638,53:POKE639,13:GOTO1080
1075 PRINT""PEEK(50000)*256+PEEK(50001)"D";:FORT=0TO8:PRINTPEEK(14358+T)"II,";:NEXT:PRINTPEEK(14367)
1076 POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111:POKE635,49:POKE636,48
1077 POKE637,48:POKE638,48:POKE639,13:GOTO1080
1080 P=PEEK(50001)+1:IFP>255THENPOKE50000,PEEK(50000)+1:P=0
1081 POKE50001,P:END
1082 X=X+(A$="A")-(A$="D"):Y=Y+(A$="W")-(A$="X"):IFX>15THENX=15
1083 IFX<0THENX=0
1084 IFY<0THENY=0
1085 IFY>15THENY=15
1086 Z=1188+X+Y*40:ZZ=PEEK(Z):IFA$="S"THEN1089
1087 IFZZ=160THENPOKEZ,76:POKEZ,160:POKEZ,76:POKEZ,160:GOTO1064
1088 IFZZ=76THENPOKEZ,160:POKEZ,76:POKEZ,160:POKEZ,76:GOTO1064
1089 GOTO1094
1090 POKEZ,160:POKEYY,PEEK(YY)OR2↑(7-(X-INT(X/8)*8)):GOTO1064
1091 IFA$<>"P"THEN1064
1092 P=53272:POKEP,30:GETA$:IFA$=""THEN1092
1093 POKEP,21:GOTO1064
1094 IFY<8ANDX<8THENYY=14336+Y
1095 IFY>7ANDX<8THENYY=14352+(Y-8)
1096 IFY<8ANDX>7THENYY=14344+Y
1097 IFY>7ANDX>7THENYY=14360+(Y-8)
1098 IFZZ=160THENPOKEZ,76:POKEYY,PEEK(YY)AND255-(2↑(7-(X-INT(X/8)*8))):GOTO1064
1099 IFZZ=76THENPOKEZ,160:POKEYY,PEEK(YY)OR2↑(7-(X-INT(X/8)*8)):GOTO1064
1100 POKE50000,0
1101 P=PEEK(50000):PRINT""P+997;:POKE198,9:POKE631,19:POKE632,13:POKE633,71:POKE634,111
1102 POKE635,49:POKE636,49:POKE637,48:POKE638,51:POKE639,13:END
1103 P=PEEK(50000):POKE50000,P+1:IFP<104THEN1101
1104 PRINT"1102      1103      1104":POKE198,4:POKE631,19:POKE632,13:POKE633,13:POKE634,13:END
```

Piano

P Fitzpatrick
Rubery,
Birmingham.

Spectrum

THIS PROGRAM simulates a piano on the Spectrum. Instructions are included in the program. The first graphic on lines 400, 420, 440, 450, 470, 490, 510, 520, 540, 560, 570, 590, 610, 630 is inverted graphic CD, and the second graphic is graphic CD.

The first graphic on lines 400, 430, 460, 480, 500, 530, 550, 580, 600, 620, is inverted graphic AB and the second graphic is graphic AB.

```
  10 GO SUB 3000
  30 REM ***GRAPHICS***
  35 FOR n=0 TO 7: READ s: POKE USR "a"+n,s: NEXT n
  40 FOR n=0 TO 7: READ s: POKE USR "b"+n,s: NEXT n
  45 FOR n=0 TO 7: READ s: POKE USR "c"+n,s: NEXT n
  50 FOR n=0 TO 7: READ s: POKE USR "d"+n,s: NEXT n
  52 FOR n=0 TO 7: READ s: POKE USR "e"+n,s: NEXT n
  55 DATA BIN 00001111,BIN 00001111,BIN 00001111,BIN 00001111,BIN 00001111,BIN 00001111,BIN 00001111,BIN 00000011
  60 DATA BIN 11110000,BIN 11110000,BIN 11110000,BIN 11110000,BIN 11110000,BIN 11110000,BIN 11110000,BIN 11000000
  70 DATA BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 11111111
  75 DATA BIN 00000000,BIN 00000000,BIN 00000000,BIN 00000000,BIN 00000000,BIN 00000000,BIN 00000000,BIN 11111111
  80 DATA BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000,BIN 10000000
  90 CLS
  92 LET bit=0
 100 PRINT AT 2,0;"Enter the length of the notes tobe played(0.1 To 2.0)"
 105 INPUT length
 199 CLS
 200 REM ***DRAW KEYBOARD***
```

(continued on next page)

SOFTWARE *File*

(continued from previous page)

```
 205 FOR n=1 TO 25 STEP 2: FOR m
=0 TO 5
 210 IF n=5 OR n=13 OR n=19 THEN
 NEXT n
 220 PRINT AT m,n;"■"
 230 NEXT m: PRINT AT m,n;"AB"
 240 NEXT n
 250 FOR k=0 TO 10: PRINT AT k,0
;"E";AT k,6;"E";AT k,14;"E";AT k
,20;"E";AT k,28;"E": NEXT k
 255 FOR j=7 TO 9: PRINT AT j,2;
"E";AT j,4;"E";AT j,8;"E";AT j,1
0;"E";AT j,12;"E";AT j,16;"E";AT
 j,18;"E";AT j,22;"E";AT j,24;"E
";AT j,26;"E": NEXT j
 260 FOR f=0 TO 26 STEP 2: PRINT
 AT 10,f;"CD": NEXT f
 300 PRINT AT 15,1;"2 3   5 6 7
 9 0   = L R"
 310 PRINT AT 17,0;"Q W E R T Y
U I O P Z X C V"
 320 PRINT AT 20,0;"NOTE LENGTH=
";length
 330 PRINT AT 21,0;"NOTE PLAYED=
"
 340 IF INKEY$="j" THEN LET pit=
-24
 350 IF INKEY$="k" THEN LET pit=
0
 360 IF INKEY$="l" THEN LET pit=
24
 370 IF INKEY$="m" THEN GO TO 50
 400 IF INKEY$="q" THEN PRINT AT
 21,12;"            ";AT 21,12
;"C";AT 10,0;"CD": BEEP length,0
+pit: PRINT AT 10,0;"CD"
 410 IF INKEY$="2" THEN PRINT AT
 21,12;"            ";AT 21,12
;"C sharp/D flat";AT 6,1;"AB":
BEEP length,1+pit: PRINT AT 6,1;
"AB"
 420 IF INKEY$="w" THEN PRINT AT
 21,12;"            ";AT 21,12
;"D";AT 10,2;"CD": BEEP length,2
+pit: PRINT AT 10,2;"CD"
 430 IF INKEY$="3" THEN PRINT AT
 21,12;"            ";AT 21,12
;"D sharp/E flat";AT 6,3;"AB": B
EEP length,3+pit: PRINT AT 6,3;"
AB"
 440 IF INKEY$="e" THEN PRINT AT
 21,12;"            ";AT 21,12
;"E";AT 10,4;"CD": BEEP length,4
+pit: PRINT AT 10,4;"CD"
 450 IF INKEY$="r" THEN PRINT AT
 21,12;"            ";AT 21,12
;"F";AT 10,6;"CD": BEEP length,5
+pit: PRINT AT 10,6;"CD"
 460 IF INKEY$="5" THEN PRINT AT
 21,12;"            ";AT 21,12
;"F sharp/G flat";AT 6,7;"AB": B
EEP length,6+pit: PRINT AT 6,7;"
AB"
 470 IF INKEY$="t" THEN PRINT AT
 21,12;"            ";AT 21,12
;"G";AT 10,8;"CD": BEEP length,7
+pit: PRINT AT 10,8;"CD"
 480 IF INKEY$="6" THEN PRINT AT
 21,12;"            ";AT 21,12
;"G sharp/A flat";AT 6,9;"AB": B
EEP length,8+pit: PRINT AT 6,9;"
AB"
 490 IF INKEY$="y" THEN PRINT AT
 21,12;"            ";AT 21,12
;"A";AT 10,10;"CD": BEEP length,
9+pit: PRINT AT 10,10;"CD"
 500 IF INKEY$="7" THEN PRINT AT
 21,12;"            ";AT 21,12
;"A sharp/B flat";AT 6,11;"AB":
BEEP length,10+pit: PRINT AT 6,1
1;"AB"
 510 IF INKEY$="u" THEN PRINT AT
 21,12;"            ";AT 21,12
;"B";AT 10,12;"CD": BEEP length,
11+pit: PRINT AT 10,12;"CD"
 520 IF INKEY$="i" THEN PRINT AT
 21,12;"            ";AT 21,12
;"C";AT 10,14;"CD": BEEP length,
12+pit: PRINT AT 10,14;"CD"
 530 IF INKEY$="9" THEN PRINT AT
 21,12;"            ";AT 21,12
;"C sharp/D flat";AT 6,15;"AB":
BEEP length,13+pit: PRINT AT 6,1
5;"AB"
 540 IF INKEY$="o" THEN PRINT AT
 21,12;"            ";AT 21,12
;"D";AT 10,16;"CD": BEEP length,
14+pit: PRINT AT 10,16;"CD"
 550 IF INKEY$="0" THEN PRINT AT
 21,12;"            ";AT 21,12
;"D sharp/E flat";AT 6,17;"AB":
BEEP length,15+pit: PRINT AT 6,1
7;"AB"
 560 IF INKEY$="p" THEN PRINT AT
 21,12;"            ";AT 21,12
;"E";AT 10,18;"CD": BEEP length,
16+pit: PRINT AT 10,18;"CD"
 570 IF INKEY$="z" THEN PRINT AT
 21,12;"            ";AT 21,12
;"F";AT 10,20;"CD": BEEP length,
17+pit: PRINT AT 10,20;"CD"
 580 IF INKEY$="s" THEN PRINT AT
 21,12;"            ";AT 21,12
;"F sharp/G flat";AT 6,21;"AB":
BEEP length,18+pit: PRINT AT 6,2
1;"AB"
 590 IF INKEY$="x" THEN PRINT AT
 21,12;"            ";AT 21,12
;"G";AT 10,22;"CD": BEEP length,
19+pit: PRINT AT 10,22;"CD"
 600 IF INKEY$="d" THEN PRINT AT
 21,12;"            ";AT 21,12
;"G sharp/A flat";AT 6,23;"AB":
BEEP length,20+pit: PRINT AT 6,2
3;"AB"
 610 IF INKEY$="c" THEN PRINT AT
 21,12;"            ";AT 21,12
;"A";AT 10,24;"CD": BEEP length,
21+pit: PRINT AT 10,24;"CD"
 620 IF INKEY$="f" THEN PRINT AT
 21,12;"            ";AT 21,12
;"A sharp/B flat";AT 6,25;"AB":
BEEP length,22+pit: PRINT AT 6,2
5;"AB"
 630 IF INKEY$="v" THEN PRINT AT
 21,12;"            ";AT 21,12
;"B";AT 10,26;"CD": BEEP length,
23+pit: PRINT AT 10,26;"CD"
5000 GO TO 340
8000 PRINT BRIGHT 1; FLASH 1;AT
0,2;"C O M P U T E R  P I A N O"
8010 PRINT AT 2,0;"This program
simulates a piano. There are six
 octaves,but only  two can be di
splayed due to the size of the s
creen.To aquire    these,use J,K
 and L."
8020 PRINT AT 8,0;" At the start
 you are required  to enter the
length of the      notes,from 0.
1 to 2.0.Then a    keyboard will
 be drawn together with the corr
esponding keys to  operate it."
8030 PRINT AT 16,0;" If at any t
ime you want to     change the l
ength of the notes, press ""M"".
"
8040 PRINT BRIGHT 1; FLASH 1;AT
21,4;"Press any key to continue"
: PAUSE 0
8050 RETURN
```

Bomb Squad

Keith Miles,
Ely,
Cambridgeshire.

BBC

THE AIM OF the game is to defuse the activated bombs whilst avoiding the pursuing boots. Unactivated bombs will explode if touched. Points are scored for defusing bombs, securing the yellow flags and luring the pursuing boots onto defused bombs — which will destroy them. Penalty points are deducted for going onto the blue squares.

The game consists of successive sets of four levels. During each of these phases the number of bombs, flags and boots doubles. At the start of the next phase the speed of the boots and the countdown of the bombs increases, as do the penalties.

The game consists of a series of linked named procedures — subroutines — whose function is self-explanatory: Characters, Init, Titles, Board, Bomb, boot, Flag, Trigger, Man, Boot, bomb, Defuse, Dead, Explode and Hiscore. The program is controlled by the loop at line 230 to 250 i.e.

230 REPEAT:PROCTRIGGER:PROCMAN:
PROCBOOT.250 UNTIL ———

Movement is achieved by use of Print Tab as a VDU command (VDU31) and contact by the Point command to detect colour.

The game runs in Mode 2 to take advantage of the greater number of colours but, for the minority of BBC Micro owners with a Model A, could easily be converted to run in Mode 5.

```
   10ENVELOPE3,129,2,4,6,30,14,7,0,0,0,-80,80,80:ENVELOPE2
,1,4,-4,1,10,20,10,127,0,0,-5,126,126:ENVELOPE1,1,0,0,0,0,
0,0,0,0,0,-1,126,0
   20DIMX%(10),Y%(10),S1%(5),S2%(5),A$(10,1)
   30MODE7:PROCcharacters:PROCinitialise:PROCtitles
   40MODE2:VDU23;8202;0;0;0;:PROCframe:CLS:LV%=3:CO%=10:sc
%=15:sp%=8
   50SC%=1000:LVL%=1
   60RA%=1:AL%=4:SP%=sp%
   70IFAL%>10 AL%=10
   80IFRA%>4 RA%=4
   90IFSP%<2 SP%=2
  100IFCO%<2 CO%=2
  110RA%=0:C%=0:E%=0:SX%=13:SY%=29:XB%=SX%:YB%=SY%:FL%=-1:D
O%=1:DL%=0:B%=0
  120PROCboard:PROCBOMB:PROCboot:PROCflag
  130REPEAT:PROCtrigger:PROCman:PROCBOOT
  140IFSC%<=0 SC%=0:PROCdead
  150COLOUR2:PRINTTAB(14,1);SC%;"  ";:UNTIL C%=AL%+1 OR E%=
1 OR SC%=0
  160IFE%=1OR SC%<=0 THEN200
  170LVL%=LVL%+1
  180IFC%=AL%+1AND AL%=10:CO%=CO%-2:sc%=sc%+5:sp%=sp%-1:LV
%=LV%+1:GOTO60
  190RA%=RA%+1:AL%=AL%+6:SP%=SP%-3:GOTO70
  200IFLV%>0THEN60
  210PROCexplode
  220COLOUR6:PRINTTAB(5,15)"BOMB-SQUAD":COLOUR2:PRINTTAB(4
,20)"ANOTHER GAME?";
  230*FX21,0
  240A$=GET$:IFA$="Y"OR A$="y" MODE7:PROChiscore:GOTO40
  250IFA$="N"OR A$="n" PRINTTAB(0,31);:END
  260GOTO240
  270DEFPROCboard
  280COLOUR2:PRINTTAB(0,0)"LEVEL""TAB(7,0)"LIVES"TAB(14,0)"
SCORE"TAB(2,1);LVL%;TAB(9,1);LV%;TAB(14,1);SC%:COLOUR4:FOR
I%=0TO19:FORJ%=2TO29:VDU224:NEXT:NEXT
  290ENDPROC
  300DEFPROCcharacters
  310VDU23,224,0,126,126,126,126,126,126,0,23,225,15,11,15
,11,255,255,3,0,23,226,129,90,60,90,126,60,90,129,23,227,0
,0,0,62,28,28,28,54,23,228,0,0,0,0,0,0,0,10,23,231,0,0,0,0
,0,0,255,171,23,232,28,28,0,0,0,0,0,0
  320VDU23,233,0,16,48,16,0,0,0,0,23,229,255,129,165,153,1
53,165,129,255,23,230,146,84,190,84,146
  330ENDPROC
  340DEFPROCinitialise
  350FORI=1TO10:A$(I,0)=STR$(I*1000):A$(I,1)="Bomb-Squad":
NEXT
  360ENDPROC
  370DEFPROCbomb
  380COLOUR7:FORI%=0TO AL%:X%(I%)=1+RND(18):Y%(I%)=1+RND(2
7):VDU31,X%(I%),Y%(I%),226:NEXT
  390ENDPROC
  400DEFPROCflag
  410FORI%=0TO AL%
  420X1%=RND(20)-1:Y1%=RND(28)+1:fg%=FNPT(X1%,Y1%):IFfg%=4
PROCmove(X1%,Y1%,3,228,1,232)
  430NEXT
  440ENDPROC
  450DEFPROCboot
  460FORI%=1TORA%
  470S1%(I%)=RND(20)-1:S2%(I%)=RND(28)+1:st%=FNPT(S1%(I%),
S2%(I%)):IFst%=4 PROCmove(S1%(I%),S2%(I%),1,225,3,231)
  480NEXT
  490ENDPROC
  500DEFPROCtrigger
  510IFFL%=-1 PROCbomb:ENDPROC
  520IFRND(1)<.95THEN550
  530R%=RND(AL%+1)-1:IFY%(R%)=-3THEN530
  540FL%=10
  550ENDPROC
  560DEFPROCbomb
  570IFFL%=0 PROCexplode:E%=1:LV%=LV%-1:ENDPROC
  580DL%=DL%+1:IFDL%=CO% DL%=0 ELSE ENDPROC
  590FL%=FL%-1:COLOUR5:COLOUR130:VDU31,X%(R%),Y%(R%),48+FL
%:COLOUR128
  600ENDPROC
  610DEFPROCman
  620VDU31,SX%,SY%,32:XB%=SX%:YB%=SY%
  630*FX21,0
  640*FX21,3
  650IFINKEY(-67)AND SY%<19 SY%=SY%+1:GOTO700
  660IFINKEY(-98)AND SX%>0 SX%=SX%-1:GOTO700
  670IFINKEY(-89)AND SY%>2 SY%=SY%-1:GOTO700
  680IFINKEY(-1)AND SY%<29 SY%=SY%+1:GOTO700
  690GOTO760
  700SOUND&11,2,50,1:an%=FNPT(SX%,SY%):ano%=FNpt(SX%,SY%)
  710IFan%=4 SC%=SC%-sc%:GOTO760
  720IFan%=14 SX%=XB%:SY%=YB%:GOTO760
  730IFanno%=5 PROCdefuse:SX%=XB%:SY%=YB%:GOTO760
  740IFan%=7OR(SX%=S1%(A%)ANDSY%=S2%(A%)) PROCdead:ENDPROC
  750IFan%=3 PROCbonus
  760PROCmove(SX%,SY%,6,227,5,232)
  770ENDPROC
  780DEFPROCbonus
  790SOUND&13,3,50,10
  800SC%=SC%+(50*LVL%)
  810ENDPROC
  820DEFPROCdefuse
  830SOUND2,1,5,1:FORJ%=0TO AL%:IFSX%<>X%(J%)ORSY%<>Y%(J%)
THEN850
  840SC%=SC%+(100*LVL%):C%=C%+1:Y%(J%)=-33
  850NEXT
  860COLOUR14:VDU31,SX%,SY%,229:FL%=-1
  870ENDPROC
  880DEFPROCdead
  890SOUND0,1,5,1:E%=1:LV%=LV%-1:IFSC%=0 LV%=0
  900VDU31,SX%,SY%,230:FORL=1TO500:NEXT
  910ENDPROC
  920DEFPROCexplode
  930FORI=1TO18:SOUND0,-15,6,10:FORJ=1TO50:VDU19,0,RND(6);
0;:NEXT:NEXT:VDU20
  940ENDPROC
  950DEFPROCtitles
  960FORI=1TO2:PRINTCHR$132CHR$157CHR$129CHR$141TAB(1,4)"BO
MB-SQUAD":NEXT
  970PRINTCHR$131"   Your task is to stay alive by"'CHR$13
1"defusing"CHR$129"MINES."'CHR$131"This can only be done" C
HR$131"once they are"CHR$130"ACTIVATED"CHR$131"and"CHR$13[illegible]
"COUNTING"
  980PRINTCHR$133"DOWN."'CHR$131"They explode if you do not
 defuse"'CHR$131"them before they reach"CHR$133"0."'CHR$131
"If you run"
  990PRINTCHR$131"into an"CHR$129"UNACTIVATED"CHR$131"mine
, it will"'CHR$129"EXPLODE."'CHR$131"   The terrain is mad
e of"CHR$132"BLUE BRICKS"'CHR$131"which must be cleared to
 permit you to"
 1000PRINTCHR$131"pass. This takes up valuable"CHR$134"ENE
RGY"'CHR$131"which is replenished when mines are"'CHR$133"
DEFUSED"CHR$131"or"CHR$130"BONUS FLAGS"CHR$131"collected.
You"'CHR$131"will soon learn to use the path you"
 1010PRINTCHR$131"have cleared to stay alive."
 1020PRINTCHR$131"   In pursuit is an old"CHR$129"ARMY BOO
T"CHR$131"that"'CHR$131"will also bring your life to an ab
rupt"'CHR$131"end if it"CHR$132"STOMPS"CHR$131"on you. Lur
e this onto"CHR$131"a"CHR$130"DEFUSED BOMB"CHR$131"to dest
roy it."
 1030PRINTCHR$131"   You have"CHR$130"3"CHR$131"lives. As
you clear"'CHR$131"successive screens you will find more"'
CHR$131"boots in pursuit, greater penalties and"CHR$131"hi
gher scores."
 1040PRINTTAB(14)CHR$136CHR$130"SPACEBAR";:A=GET
 1050ENDPROC
 1060DEFPROCframe
 1070COLOUR4:FORI%=0TO30:FORJ%=0TO19:VDU224:NEXT:NEXT
 1080COLOUR1:PRINTTAB(5,1)"BOMB-SQUAD":COLOUR7:PRINTTAB(2,
4)CHR$226TAB(5,4)"BOMB":COLOUR5:COLOUR130:PRINTTAB(2,6)"1"
:COLOUR128:PRINTTAB(5,6)"ACTIVE"TAB(13,6)"BOMB"
 1090COLOUR14:PRINTTAB(2,8)CHR$229TAB(5,8)"DEFUSED"TAB(13,
8)"BOMB"
 1100VDU31,2,10,32,5,25,4,128;704;0,3,1,225,0,0,3,3,231,
4
 1110COLOUR1:PRINTTAB(5,10)"BOOT":COLOUR3:PRINTTAB(5,12)"F
LAG":COLOUR6:PRINTTAB(5,14)"YOUR"TAB(10,14)"MAN"
 1120VDU31,2,12,32,5,25,4,128;640;0,3,3,228,0,0,3,1,232,
4
 1130VDU31,2,14,32,5,25,4,128;576;0,3,6,227,0,0,3,5,232,
```

```
4
1140COLOUR3:PRINTTAB(1,16)"CONTROLS:"TAB(2,18)"Z"TAB(14,1
8)"LEFT"TAB(2,20)"X"TAB(14,20)"RIGHT"TAB(2,22)"]"TAB(14,22
)"UP"TAB(2,24)"SHIFT"TAB(14,24)"DOWN":COLOUR1:PRINTTAB(7,2
9)"PRESS <SPACE>";
1150I=0:REPEATI=I+1:SOUND0,-15,1,10:UNTILI=5
1160IFINKEY$(100)=" "THEN1170ELSE1150
1170ENDPROC
1180DEFPROCBOOT
1190IFB%=A% ENDPROC
1200GO%=GO%+1:IFGO%<SP% ENDPROC
1210A%=A%+1:IFA%>MAX A%=1
1220IFS1%(A%)=-32AND B%<>MAXTHEN1210
1230*FX21,6
1240*FX21,7
1250COLOUR4:VDU31,S1%(A%),S2%(A%),224
1260O1%=S1%(A%):O2%=S2%(A%)
1270S1%(A%)=S1%(A%)+(S1%(A%)>SX%)-(S1%(A%)<SX%):S2%(A%)=S
2%(A%)+(S2%(A%)>SY%)-(S2%(A%)<SY%)
1280m%=FNPT(S1%(A%),S2%(A%)):mvo%=FNpt(S1%(A%),S2%(A%))
1290IFm%=4 SOUND0,1,5,1:B%=B%+1:m%=10%+100:COLOUR4:V
DU31,O1%,O2%,224,31,S1%(A%),S2%(A%),224:S1%(A%)=-32:COLOUR
2:GOTO1350
1300IFSX%=S1%(A%)ANDSY%=S2%(A%) PROCdead
1310IFmv%=3 SC%=SC%-50
1320IFmv%=7OR mvo%=5 S1%(A%)=O1%:S2%(A%)=O2%
1330SOUND&12,2,50,10:SOUND3,3,50,1
1340PROCmove(S1%(A%),S2%(A%),1,225,3,231)
1350GO%=0
1360ENDPROC
1370DEFPROChiscore
1380IFSC%>VAL(A$(1,0)) FORI=1TO2:PRINTTAB(12,I)CHR$129CHR
$141"BOMB-SQUAD";NEXT:PRINT CHR$131"ENTER YOUR NAME..";A$(1
,0)=STR$(SC%):PRINT CHR$132A$(1,0)"....";:INPUTA$(1,1)
1390REPEAT:SWAP=0:I%=0:REPEAT:I%=I%+1:IFVAL(A$(I%,0))>VAL
(A$(I%+1,0)) B$=A$(I%+1,0):A$(I%+1,0)=A$(I%,0):A$(I%,0)=B$
:B$=A$(I%+1,1):A$(I%+1,1)=A$(I%,1):A$(I%,1)=B$:SWAP=1
1400UNTILI%=9:UNTILSWAP=0
1410CLS:FORI=1TO2:PRINTTAB(12,I)CHR$129CHR$141"HALL OF FA
ME.":NEXT:FORI%=10TO1STEP-1:A%=LEN(A$(I%,0)):PRINT CHR$131
TAB(16-A%);A$(I%,0);"...";A$(I%,1):NEXT:PRINT CHR$129TAB(1
3)"PRESS <SPACE>";:A$=GET$
1420ENDPROC
1430DEFFNPT(d%,e%
1440=POINT((d%*64 +32,1008-(e%*32))
1450DEFFNpt(f%,g%
1460=POINT((f%*64 +32,1023-(g%*32))
1470DEFPROCmove(k%,l%,m%,n%,o%,p%)
1480VDU31,k%,l%,31,5,25,4,k%*64;1023-(32*l%);18,3,m%,n%,8
,8,3,o%,p%,4
1490ENDPROC
```

Juggler

Jason Charlesworth,
Kings Lynn,
Norfolk.

Amstrad

JUGGLER is a very simple but enjoyable game for the Amstrad CPC-464.

Written in machine code, the game features hires multicolour sprites, continuous music, joystick or keyboard option and a high score table. In the game you must keep the balls in the air by bouncing them off a bat which you control at the bottom of the screen. At first there is only one ball but every 30 seconds a new one is added to a maximum of five. You get points for however many seconds you keep the balls flying and the amount of points you get per second increases with every extra ball.

To set the program up, type in listing 1 and save it with

SAVE "JUGGLER"

Next type in listing 2 and run it. This program pokes in machine code and checks it at the same time for errors. If it finds an error, correct it then rerun the program until you get a "Finished, no errors" message. Then save the code directly after "Juggler" with

SAVE "CODE",b,37000,3000

The game may then be played by rewinding the cassette and typing RUN"".

In you wish to see all the levels, when it asks you to press s to start, leave the keys for a while and the program will give a demo — you can get out of the demo by pressing 0.

Finally, thank you to Robert Rhodes who translated the music for me.

```
100 DEF FN x(n)=10*((PEEK(n) AND 240)/16)+(PEEK(n) AND
 15)
110 MEMORY 32767
120 MODE 2:PRINT"Please wait":LOAD "!"
130 ENV 1,1,.0,1,5,1,1,5,-2,1,5,1,2
140 RESTORE 330:DIM n$(5),n(5):FOR a=1 TO 5:READ n$(a)
,n(a):NEXT a
150 MODE 0:TAG:PLOT 640,400,2:a$="Juggler":a=1:b=600:c
=1:EVERY 1 GOSUB 170
160 IF a<>8 THEN 160 ELSE 190
170 MOVE b,396:PRINT MID$(a$,a,1);:b=b-4:IF b=(1.5+a*2
)*32 THEN b=600:a=a+1
180 RETURN
190 DI:TAGOFF:RESTORE:FOR a=0 TO 5:READ a$,p:LOCATE 1,
2*a+4:PEN p:PRINT a$:NEXT a
200 DATA Left           Z,6,Right          \,10,Halt
     H,4,Start          S,2,Music On/Off  SPACE,12,Abo
rt       0,3
210 LOCATE 1,17:PEN 1:PRINT"Or use the joystick.":PEN
12:LOCATE 2,21:PRINT"Press S to start.":PEN 1
220 FOR a=0 TO 3000:a$=INKEY$:IF a$="s"OR a$="S" THEN
230 ELSE NEXT a:CALL 37000:CLS:PEN 2:PRINT"   J u g g
l e r":GOTO 190
230 CALL 37033:sc=10000*FN x(38027)+100*FN x(38026)+FN
 x(38025)
240 FOR b=0 TO 200:a$=INKEY$:NEXT b
250 FOR a=1 TO 5:IF sc<n(a) THEN NEXT a:GOTO 290
260 IF a<>5 THEN FOR b=5 TO a+1 STEP -1:n$(b)=n$(b-1):
n(b)=n(b-1):NEXT b
270 LOCATE 1,24:INPUT "Name Please ";n$(a)
280 n(a)=sc
290 CLS:PEN 2:PRINT"  High Score Table":FOR a=1 TO 5:L
OCATE 1,4+2*a:PEN a:PRINT n(a)
300 LOCATE 6,4+2*a:PRINT n$(a):NEXT a
310 PEN 12:LOCATE 1,22:PRINT"Press a key to start"
320 IF INKEY$="" THEN 320 ELSE PEN 2:CLS:PRINT"  J u g
 g l e r":GOTO 190
330 DATA Danger Mouse,400,Penfold,300,Shaggy the Yak,2
00,Dougal McAngus,100,Black Adder,30
```

```
10 MEMORY 32767:PRINT"please wait":x=37000
20 DIM t(35):FOR a=0 TO 35:READ t(a):NEXT a
30 FOR a=0 TO 35:READ a$:t=0:FOR b=0 TO 79:z=VAL("&"+M
ID$(a$,b*2-1,2)):POKE x,z:t=t+z:x=x+1:NEXT b:IF t<>t(a
) THEN 50
40 NEXT a:PRINT"Finished,no errors.":END
50 PRINT"Error in line 60 or line ";a*10+70:END
60 DATA 12352,7509,7218,8870,8987,9196,9644,5830,7930,
7805,9474,8754,6993,3233,0,4792,5552,3514,4392,7552,54
80,4476,7048,5997,5396,3
410,3313,4383,4804,3010,5281,3636,4394,4092,4059,2584
70 DATA C38890CDF292CD4A91CDA9923AA294FE04300CD19BCCD
FD91CDA291CDD590CDA992CD7192CD56913AA394FE0028DAC9CDF2
92CD4A91CD19BCCDFD91CDA2
91CDD590CD56913AA394FE0028EAC93AA491
80 DATA FE01C03E02CDADBCE607FE03382F2AA5942323 7EFE0028
252B2B7C320F91237E32109123 7E32139123 22A5942 1CD91CDAABC
1809020000DE01000A18003E
04CDADBCE607FE03D82AA79423237EFE00C8
90 DATA 32A8912B2B7E32449123 7E3245912323 22A79421417 1CC
AABC0100000500002FCC0021AA941189940 12100EDB0C93E2FCD1E
BB28153AA994FE0128133E01
32A9943AA434EE01324A9418049732A9943E
100 DATA 2CCD1EB32818CDB6BC3E3CCD1EBB28F921000011000C
D10BD3E07CDB38C3E20CD1EBBC83E0132A394C9CD0DBD07CFE01C07
DFE2808D62E2600CD10BDCD4
A943AA194D6012732A1942105002240 94E6F0
110 DATA 1F1F1F1FC630CDC3933AA194E60FC630CDC3933AA194F
E00C03E3032A19421269822A59421D99922A7943AA2943CFE06CB3
2A294C93AA294472180 94E5C
54E2346235E2356798 34FFE022005 1E01CDE4
120 DATA 92FE462005 1EFFCD8492780247FE0C20051601CD8492F
EB62005 16FFCD8492FEAF20103A8C943C91C606FE0E3005 16FFCDB
492722B732B702B7121CC94D
1D53A42743C92571E00A7CB1ACB1B19CD4193
130 DATA C1E123232323 1094C92180DF0650978623 10FC473AA39
4B032A394C9E5F5D5C5 78C62832A3922 1A09234A494FE0028 03CDA
ABC1D1F1E1C9010100D9000
00F0F00CD7C933A8C9483FE452002 3E44FEFF
140 DATA 200197 32BC945F16002 180C7193600230 60A363C2310F
B360021 81CF1936002306 03360C2310FB360021 82D71936002306 0
636302310FB3600C997CD0EB
C21509306141 10000ED5348947ECDC3932310
150 DATA F93E030600CD34933E0B0604CD34933E04 0600CD34933
E0C0600CD34932 100001 10000CD10BD3E3032A194CY1600CDDEBB5
B21100078A7 1F4FD5C5CDEAB
BC1D126013E7E916FE5C5CDF6BBC1E116023E
160 DATA 7C905FD5C5CDF6BBC1E1211000C3F6B054494D4520303
020534 34F52452 03030303030 1E003E1ACD1EEB28021DC93E4BC
D1EBB28021CC93E47CD1EBB2
8021DC93E16CD1EBBCB1CC9E579E71600625F
170 DATA 3EC7906FCD1DBCD18610C5E5010800EBED B0EBE1CD26B
CC110F0C9E5D5C5F5FE30385FFE3A305BD63017 1717F52A48947DB
787875F16003E1894B7E787C
6076F2600CD1DDCF1C6CC16973F0001140607
180 DATA 1AD50E03.E20A717CB1317CB135797CB4B28023E0BCB4
32802C6047723 7A0D20E311FD0719D11310D7214894 34F1C1D1E1C
F2A48943E1FCD5ABB2C7DCD5
ABB247CC5 5A86F1CD5ABB21487434C1D1E1C9
190 DATA 0700210E2002 748943AA29421899486 2777300E233E018
62777300623 3E0186277721899423230603 7E4FE6F01F1F1F1FC63
0CDC39379E60FC630CDC3932
B10EB0903000 1907A801FF0E9601FF105AFF
200 DATA 0122640101 2C78FF01272101005 29E279AC0020000190
432FF010E4601FF105AFF01225401012C76FF0130010800 2698D99
F000002020000000020200000
2000000000000200000000000000000000200
210 DATA 0000000000200000000000000000000000000000000020000000
0000000000000000000000000000000000200000000000000000000000000
0200000000000000000000000
00000002000000000020000000000000000000
220 DATA 000000000000000000000000000000000000000000000000000
000000200000000044CCCC8000000044DCFDFCEC9800004 4BC3C3C7
C800002DC3C3B343CEC0000D
C3C3034 3CEC0000DC3C3B343CEC0000DC3C38
230 DATA 343CEC0000DC3C3B343CEC0000DC3C38 343CEC0000DC3
C30303CEC0000DC3C3030 3CEC0000 44BC3C3C7C8800004 4CFCFCE
C88000000 44CCCC80000000
00000000000000000000000000000000000000143C
240 DATA 3C28000000142D0F0F1E2800001 40E2C0C0028000 02C1
BCCCC241E00002D4C30308C1E0000 2D1A30308C1E00002D1030 3C0
C1E0000 2D1BCCCC241E00002
C4C30302 41E00002D4C30308C1E00002D4CCC
250 DATA CCEC1E0000140E0C0C0028000 0142D0F0F1E28000000 1
43C3C28000000000000000000000000000000000000000000040C0CCE
000000040913333628000004
073F3F3B380000091B2FCFC7162000091F630
260 DATA 30F9620000 91D23030F96200009 1D274FC7162000091B
23030F9620000 91B23030F9620000 91F63030F9520000 91B2FCFC7
1620000407 3F3F3B3600 0004
0913333623 0000000040C0C00000000000000
270 DATA 2000000000003000000000000000020005 0F0F0A00000005 0B
1333372A000005066CCC99A00000B13CCC1C4C720000B18C0C3C4
C720000B19C1C1C4C720000B
18C2C1C4C720000B19C0C1C4C720000B19C3C
280 DATA 3C6C720000B18C0C1C4C720000B18C0C1C4C720000506
```

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```
6CCCC99A0000050013333372A00000005 0F0F0A000000000000000030
0000000000000000000000000
0103030200000001034 3C3C38200000010CCCC
290 DATA C3CC20000034CCCCCCCC38000034CC3C3C3C38000034C
C3C3C3C380000034CCC3CC9C38000034CCCCCCCC3800003 43C3C3CC
C300000034CC3C3CCC3300003
4CCCC6CCC3800001 06CCCCC9C200000103 43C
300 DATA 3C382000020010303020000000000000020000000007 8848
48484847800103010101010 7C0078 840478 0034FC0078 84043E048
47800182848888 0FC080 0FC8
480F304847800078 34 80F8846 47300FC840408
310 DATA 1020200007 80484788 48478007 8048 47C04647 80000000
000000000000000FA0110300218FA01 1 80FA011AAA0 1 87B0118AA0
118DE0118FA0 1 87B0118AA0
118DE0118AA0118DE0118FA0118AA0118DE01
320 DATA 18FA011A53030C38020C86030C38020C53030C38020CF
6020C38020CA4020C38020C7E020C38020CA4020C38020CF6020C3
8020C53030C38020C7E020C3
8020CA4020C38020CF6020C38020CA4020C38
330 DATA 020CF6020C38020C53030C38020CA4020C38020CF6022
C38020C53030C38020C70040C38020C5A020C38020C70040C38020
CF4030C38020C8C030C38020
C53030C38020CF6020C7B010CAA010C7BE10C
340 DATA F6020C7B010CA4020C7B010C7E020C7B010C38020C7B0
10CAA010CFA010C38020CFA010C7E02185201187B011EAA0118C30
10C38020C7E020C38020CA40
2187B0118AA0118C30113FA010C7E020CA402
350 DATA 0C7E020CF6021EAA0118C30118FA0118380218FA0118C
301187E0118380218C30118A40218380218530 30CF6020CA4020C7
E020C3E0218700418F403185
30318CC0718700416E40418F6021870040CB6
360 DATA 030CF6020C7E020CA402185303183802067E0206380 20
C70041853031 3A7061847051870041853030 6BC03065303185 7033
C53033C003000200000000003
00020003F010CD5000C52010CC5000C3F010C
370 DATA D5000C1C010CD5000CFD000CD5000CEF000CD5000CFD0
00CE5000C1C010CD5000C3F010CD5000CEF000CD5000CFD000CD50
00C1C01 0CD5000CFD000CD50
00C1C010CD5000C3F010CD5000CFD000CD500
380 DATA 0C1C010CD5000C3F010CD5000C52011870011852011 83
F0110 1C0116FD00 1A1C0116 3F01135201 18FD001 81C01103F0 11E1
C0110 3F0118520 1 81C0111E3
F01185201187B0118FD0016EF0013D50018BE
390 DATA 0018A9001 83F010C9F020CA9000C9F200C3F010C9F020
C1C010C9F000CFD000C9F000CE1000C9F000CA9000CD5000CE1002
CD5000C7F000CFD000CBE000
CFD000C9F000CFD000CA9000CFD000CBE000C
400 DATA 21000CFD000CE1000C0E000C CA01AC9F000C1C010CA90
00C1C010CBE000C1C010CD5000CFD000C1C010CFD000C9F000C3F0
10CA9000C3F010CBE000C3F0
10CD5000C3F010CF1000C3F010CC5000C3F01
410 DATA 0CBE000C3F010CD5000C3F010CE1000C3F010CFD000C3
F010C1C010C3F010C52010C7B010C52011 8D5001 87B0118E10016A
A010C7B010C6A010CAA010C2
0010CAA010C1C010CAA010CFD000CAA010CC3
420 DATA 010CFA010CC3010C7B010C1C01303F010C52010C3F010
C52010C7B010C52010CAA011EC3010CFA010C38020C7E020CA4020
CF6020C000000000000000000
002000000000000000000000000000000000000
```

Error Simulation

Joe Pritchard,
Gelding,
Nottingham.

ONE PROBLEM that I keep coming up against when finishing off my Basic program is testing the error trapping routines. Most of my programs are used by other people than myself, and so it's important that the programs respond to errors in a reasonably graceful fashion! For example, I often want to reprompt the user to try again if an error such as "No Such File" has been generated.

The usual method I use to test such routines is to deliberately cause the error, by typing in a non existent file name, for example. However, this technique is not always useful; it's hard to simulate a "Disc Full" error with two short files on a disc!

Machines like the MSX computers have a command called ERROR which allows the programmer to simulate an error condition. This program adds a similar command, called *ERR, to the BBC Micro. The syntax is

*ERR n or *ERR variable name

where the value of n or the variable is the number of the error you wish to simulate. Thus *ERR 4 will simulate the Mistake error. The message Simulated Error will be printed to the screen as the Report, but ERR will be set to the value of n and ERL will be set accordingly.

The simulated error can be trapped by the Basic On Error trap, in which case the Report will not be printed but ERR and ERL will be set up properly, as mentioned above. The code is less than 256 bytes long, and so I keep it safely in page &A.

You might like to set up function keys to change the CLI vector to point to the new machine code and reset the CLI vector when the new command is no longer required. As an example, if the below line is part of your error trap;

1000 IF ERR = 4 THEN PRINT"Ooops!!"

then executing a *ERR 4 somewhere in the program, with the On Error active, will result in "Ooops!!" being printed to the screen.

```
10 REM *ERR command to help
20 REM Program testing
30 REM Joe Pritchard, 1985
40 REM If BASIC I in use change
50 REM line 370 to JSR &928C
60
70 PROCassemble
80 *ERR 34
90 END
100
110 DEFPROCassemble
120 oldvec=?&208+256*?&209
130 iac=&2A
140 pointer=11
150 pointer2=&19
160 tempy=&70
170 ?&208=&0A00 MOD 256
180 ?&209=&0A00 DIV 256
190 FOR pass=0 TO 2 STEP 2
200 P%=&0A00
210 [OPT pass
220 LDA pointer+1:STA tempy
230 LDY 10
240 DEY
250 .conloop
260 JSR getchar
270 CMP &69:BNE notours
280 JSR getchar
290 CMP &82
300 BNE notours
310 JSR getchar
320 CMP &82
330 BNE notours
340 INY:STY &1B
350 LDA pointer:STA pointer2
360 LDA pointer+1:STA pointer2+1
370 JSR &92DD
380 LDA iac
390 STA errno
400 .error BRK
410 .errno EQUB 0
420 EQUS "Simulated Error"
430 EQUB 0
440 .notours LDY tempy
450 JMP oldvec
460
470 .getchar INY:LDA (pointer),Y:RTS
480 ]
490 NEXT
500 ENDPROC
```

Connect Four

M J Lake,
Bitterne,
Southampton.

CONNECT FOUR is a game for one player on either the 16 or 48K Sinclair Spectrum. It is based on the popular board game of the same name, with the Spectrum playing as your opponent.

The program is written in a fairly structured way, and, with the exception of the graphics and sound, should be fairly easy to convert to other machines.

For those of you who have never played the game before, here is a brief outline of the rules. The object of the game is to get a line of four counters on the board, either horizontally, vertically, or diagonally.

While trying to get your own line, you must also attempt to prevent your Spectrum from getting a line of its own, by blocking its counters with yours. The winner is the first to get a line of four counters.

Keys: Left – 5; Drop – 0; Right – 8. The letters in Italics on the listing refer to the Spectrum's UDG characters.

```
   2 REM ************************
   3 REM *                      *
   4 REM *       CONNECT 4      *
   5 REM *                      *
   6 REM ************************
  10 GO SUB 2000: GO SUB 3000
  15 DATA 3,15,63,63,127,127,255
,255,192,240,252,252,254,254,255
,255,255,255,127
  17 DATA 127,63,63,15,3,255,255
,254,254,252,252,240,192,128,64,
32
  19 DATA 16,8,4,2,1,1,2,4,8,16,
32,64,128,255,255,255,255,255,25
5,255,255
  26 RESTORE : FOR n=0 TO 55: RE
AD a: POKE USR "a"+n,a: NEXT n
  50 DIM m(8,9): FOR n=1 TO 9: L
ET m(1,n)=3: LET m(8,n)=3: NEXT
n
  60 LET me=0: LET you=0
 100 CLS : BORDER 0: PRINT AT 2,
0;" "
 101 FOR n=1 TO 6
 102 PRINT INK 2;"      GGGGGGGG
GGGGGGGGGGG    "
 103 PRINT INK 2;"      G  G  G
G  G  G  G     "
 104 PRINT INK 2;"      G  G  G
G  G  G  G     ": NEXT n
 105 PRINT INK 2;"      GGGGGGGG
GGGGGGGGGGG    "
 110 FOR n=0 TO 2: PRINT PAPER 5
;AT n,0;"

 111 NEXT n
 115 FOR n=3 TO 21: PRINT AT n,0
; PAPER 5;"     ": NEXT n
 120 FOR n=3 TO 21: PRINT AT n,2
7; PAPER 5;"     ": NEXT n
 125 PAUSE 50: BEEP .5,20: PRIN
T AT 0,5; INK 0;"Press any key t
o start": PAUSE 0
 130 PRINT AT 0,5; PAPER 5;"
                  ": BEEP .25,25
 135 LET go=-1: LET r=RND*10+1:
IF r>5 THEN LET go=1
```

```
 137 LET z=0: LET d=6: LET found
=0: LET move=0
 250 LET move=move+1: LET go=go+
-1: IF move>42 THEN GO TO 1100
 252 IF go=1 THEN GO TO 300
 255 PRINT AT 0,12; BRIGHT 1; PA
PER 6; INK 1;"My Move": BEEP .25
,21
 257 PAUSE 40
 260 PRINT AT 0,12; BRIGHT 0; PA
PER 5;"        "
 265 LET sf=1: LET z=2: LET x3=0
 266 IF move<5 THEN GO TO 275
 268 GO SUB 650
 270 LET z=1: GO SUB 650
 273 LET z=2: IF found=1 THEN LE
T m(y1,x1)=0
 274 IF found=1 THEN GO TO 350
 275 IF x3<>0 THEN GO TO 870
 276 LET w=INT (RND*7)+2: IF m(2
,w)<>0 THEN GO TO 275
 277 LET y=2: LET x=w
 280 PRINT AT 1,d; PAPER 5;"  ";
AT 2,d;"  "
 281 PRINT AT 1,3+((x-1)*3); INK
 1; PAPER 5; FLASH 1;"EF";AT 2,3
+((x-1)*3);"EF"
 282 PAUSE 100
 283 GO SUB 400
 285 PAUSE 100: PRINT AT 1,3+((x
-1)*3); PAPER 5;"  ";AT 2,3+((x-
1)*3); PAPER 5;"  "
 290 GO TO 250
 300 PRINT AT 0,11; INK 1; PAPER
 6; BRIGHT 1;"Your Move": BEEP .
25,35
 302 PAUSE 40: LET sf=0
 305 PRINT AT 0,11; BRIGHT 0; PA
PER 5;"         "
 309 LET r=1: LET d=15: LET x=5:
 LET y=2: LET z=1
 310 PRINT PAPER 5; INK 0; FLASH
 1;AT c,d;"EF";AT c+1,d;"EF"
 315 PAUSE 1: LET z$=INKEY$: IF
z$="" THEN GO TO 315
 317 IF z$="5" OR z$="8" OR z$="
0" THEN GO TO 320
 318 GO TO 315
 320 BEEP .2,12: PRINT AT c,d; P
APER 5;"  ";AT c+1,d;"  "
 325 IF z$="8" THEN LET d=d+3
 326 IF z$="8" THEN LET x=x+1
 330 IF d>24 THEN LET d=24
 331 IF x>8 THEN LET x=8
 335 IF z$="5" THEN LET d=d-3
 336 IF z$="5" THEN LET x=x-1
 340 IF d<6 THEN LET d=6
 341 IF x<2 THEN LET x=2
 345 IF z$="0" THEN GO TO 355
 350 GO TO 310
 355 IF m(2,x)<>0 THEN GO TO 309
 356 GO SUB 400
 355 GO SUB 700: IF found=1 THEN
 GO TO 1000
 395 GO TO 250
 401 IF m(1+y,x)=0 THEN LET y=y+
1
 405 IF m(1+y,x)<>0 THEN GO TO 4
20
 410 GO TO 401
 420 LET m(y,x)=z
 450 LET a=1: LET b=3
 455 IF z=1 THEN LET ir=6
 460 IF z=1 THEN LET pa=1
 465 IF z=2 THEN LET ir=1
 470 IF z=2 THEN LET pa=6
 475 LET a=a+(y-1)*3: LET b=b+(x
-1)*3
 480 PRINT INK in; PAPER pa;AT a
,b;"AB";AT a+1,b;"CD"
 482 FOR n=40 TO 0 STEP -5: BEEP
 .01,n: NEXT n
 485 RETURN
 500 IF sf=0 THEN RETURN
 505 PRINT AT 1,d; PAPER 5;"  ";
AT 2,d;"  "
 510 LET d=6+INT (RND*6)*3
 515 PRINT INK 1; FLASH 1;AT 1,d
;"EF";AT 2,d;"EF"
 520 PAUSE 5: RETURN
 530 LET n=0
 531 LET temp=0
 535 LET t=m(y+n,x): IF t=z THEN
 LET temp=temp+1
 540 LET n=n+1: IF z=t THEN GO T
O 535
 545 IF temp>=4 THEN LET found=1
 546 IF temp>2 AND z=1 THEN LET
x3=x
 547 RETURN
 550 LET n=0: LET temp=0
 555 LET t=m(y,x-n): IF t=z THEN
 LET temp=temp+1
 560 LET n=n+1: IF t=z THEN GO T
O 555
 565 LET n=1
 567 LET t=m(y,x+n): IF t=z THEN
 LET temp=temp+1
 569 LET n=n+1: IF t=z THEN GO T
O 567
 570 IF temp>=4 THEN LET found=1
 571 IF temp>2 AND z=1 THEN LET
x3=x
 572 RETURN
 575 LET n=1: LET temp=0
 577 LET t=m(y+n,x+n): IF t=z TH
EN LET temp=temp+1
 579 LET n=n+1: IF t=z THEN GO T
O 577
 581 LET n=0
 583 LET t=m(y-n,x-n): IF t=z TH
EN LET temp=temp+1
 585 LET n=n+1: IF t=z THEN GO T
O 583
 587 IF temp>=4 THEN LET found=1
 588 IF temp>2 AND z=2 THEN LET
x3=x
 589 RETURN
 600 LET n=0: LET temp=0
 605 LET t=m(y+n,x-n): IF t=z TH
EN LET temp=temp+1
 610 LET n=n+1: IF t=z THEN GO T
O 605
 615 LET n=1
 620 LET t=m(y-n,x+n): IF t=z TH
EN LET temp=temp+1
 625 LET n=n+1: IF t=z THEN GO T
O 620
 630 IF temp>=4 THEN LET found=1
 632 IF temp>2 AND z=2 THEN LET
x3=x
 635 RETURN
 650 LET found=0
 655 FOR y=2 TO 7: FOR x=2 TO 8
 660 LET t=m(y,x): IF t=0 THEN G
O SUB 690
 665 IF found=1 THEN GO TO 675
 670 NEXT x: NEXT y
 675 LET y=2: RETURN
 690 IF m(y+1,x)=0 THEN RETURN
 691 LET m(y,x)=z: GO SUB 700
 692 IF found=0 THEN LET m(y,x)=
0
 693 IF found=1 THEN LET y1=y
 694 IF found=1 THEN LET x1=x
 695 RETURN
 700 GO SUB 530
 705 GO SUB 550
 710 GO SUB 575
 715 GO SUB 600
 720 RETURN
 800 IF z=1 THEN GO TO 675
 802 PRINT AT 1,d; PAPER 5; INK
1;"  ";AT 2,d;"  ";AT 1,3+((x-1)
*3); INK 1; FLASH 1;"EF";AT 2,3+
((x-1)*3);"EF"
 805 PAUSE 50
 810 GO SUB 450
 815 GO TO 1000
 850 LET found=0
 852 PRINT AT 1,d; PAPER 5;"  ";
AT 2,d;"  "
 854 PRINT AT 1,3+((x-1)*3); FLA
SH 1; PAPER 5;"EF";AT 2,3+((x-1)
*3);"EF"
 855 PAUSE 100
 856 PRINT PAPER 5;AT 1,3+((x-1)
*3);"  ";AT 2,3+((x-1)*3);"  "
 860 GO SUB 400
 865 PAUSE 100: GO TO 250
 870 LET x=x3: GO TO 850
1000 IF z=1 THEN LET you=you+1
1002 BEEP .5,3: BEEP .2,5: BEEP
.5,9
1005 IF z=2 THEN LET me=me+1
1010 IF z=1 THEN PRINT AT 0,12;
BRIGHT 1; PAPER 6; INK 1; FLASH
1;"YOU WIN"
1015 IF z=2 THEN PRINT AT 0,12;
BRIGHT 1; PAPER 6; INK 1; FLASH
1;"I WIN"
1020 FOR n=0 TO 200: NEXT n
1025 PRINT AT 0,12; PAPER 5;"
     "
1027 PRINT AT 11,1; PAPER 5; INK
 0;"Me";AT 13,2;me;AT 11,28;"You
";AT 13,29;you
1030 LET a=1: LET b=3
1035 FOR x=2 TO 8: FOR y=7 TO 2
STEP -1
1037 LET m(y,x)=0
1040 PRINT PAPER 7;AT a+((y-1)*3
),b+((x-1)*3);"  "
1042 PRINT PAPER 7;AT a+1+((y-1)
*3),b+((x-1)*3);"  "
1045 LET r=INT (RND*12)+1: BEEP
.02,r
1050 NEXT y: NEXT x
1052 PRINT AT 1,6; PAPER 5;"
     "
1053 PRINT AT 2,6; PAPER 5;"
     "
1055 GO TO 135
1100 PRINT PAPER 5; INK 0;AT 0,9
;"It's a draw"
1105 FOR k=1 TO 200: NEXT k
1110 PRINT AT 0,9;"            "
1115 GO TO 1030
2000 PAPER 6: INK 1: BORDER 6: C
LS
2010 PRINT AT 3,8;"CONNECT 4": P
AUSE 100: RETURN
3000 BORDER 7: PAPER 7: INK 0: C
LS
3010 PRINT AT 3,12;"CONNECT 4"
3020 PRINT AT 5,0;"CAN YOU BEAT
YOUR SPECTRUM?"
3030 PRINT ''"Get 4 in a row, ei
ther;             horizontal,vertica
l or diagonal."
3040 PRINT ''"Press   8-Left  5-
Right  0-Drop"
3050 PRINT AT 18,5; FLASH 1;"PRE
SS ANY KEY": PAUSE 0
3060 CLS : RETURN
```

Hi-res Skyscraper

Alan Lee,
Tring,
Hertfordshire.

ZX-81

This is a version of the popular game in which a spaceship continually passing over a city has to flatten the buildings in order to clear a landing strip. The spaceship gets lower on each pass and vaporises if it hits a building. If the ship lands successfully you move on to another screen of buildings, but the ship moves faster, and starts off one line lower than before.

A point is scored for each building block knocked out, the score is shown in the top-left corner. A bomb is released by pressing any key, though only one bomb can be in the air at any time. To restart the game after the ship crashes, press any key.

The program is 818 bytes long. To create a Rem statement large enough type in:

1 REM ** 160 characters **

Edit this line four times to create lines 2-5. Then enter:

POKE 16511,58
POKE 16512,3
POKE 16514,118
POKE 16515,118

Then enter a line 6 Rem newline, followed by

POKE 16419,6

This line is needed to prevent the ZX-81 going into an infinite scrolling loop when the hex loader is deleted — do not remove it at any time. Now enter the standard YC hex loader and enter the machine code in the usual way. Then save the program a couple of times, and run it using Rand USR 16993. If it works correctly enter the following lines:

10 SAVE "SKY"
20 RAND USR 16993

and run it to create a final copy which runs automatically on loading. You will have to switch off the machine and reload to do this, as the program is a continuous machine-code loop. If the program does not work correctly, again switch off the machine, reload, and enter a standard hex-checker to find the errors in the machine code.

The program will not work if a peripheral is attached which lies in the 8K-15K area of Rom.

The loader.

```
 10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
 20 INPUT "Start ";s
 30 INPUT "Finish ";f
 40 FOR n=s TO f STEP 8
 50 LET tot=0: PRINT n;"  ";
 60 INPUT h$: PRINT h$;
 70 LET x=0
 80 FOR h=1 TO LEN h$ STEP 2
 90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT h
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

The hex dump.

```
16514: 1414141414141414 = 160
16522: 140C0C1530173F15 = 220
16530: 943B5435B0941035 = 909
16538: 14161698150F0995 = 419
16546: 1411115118031115 = 369
16554: 0387342694E61234 = 634
16562: 02940294029410294 = 600
16570: 9402020202020294 = 308
16578: 1414141420110694 = 283
16586: 1414151515118294 = 398
16594: 152626262626261514 = 252
16602: 1515151515151514 = 167
16610: 15262622159B3F14 = 368
```

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```
16618: 1525201520261514 = 223
16626: 9B9B3838383F2014 = 593
16634: 0F84152026261514 = 365
16642: 2015981126261514 = 342
16650: 0F2620159B9B9B14 = 639
16658: 1526261526261514 = 235
16666: 1526261120159B14 = 342
16674: 8B9B150A14202614 = 435
16682: 9126251592261E14 = 485
16690: 2015140A149B2088 = 429
16698: 14141511199B1414 = 294
16706: 0001020300141516 = 69
16714: 0000170000000000 = 23
16722: 0000000000000001 = 1
16730: 0010F2010F0A0A0A = 299
16738: 00F5C5D5F5781717 = 1066
16746: 1747F11600592100 = 479
16754: 5719111210004352 = 217
16762: 031910FDE5171717 = 595
16770: 5F16002182401 9E5 = 598
16778: 01E106081A77D511 = 823
16786: 210019D11310F5D1 = 756
16794: C1F1C92100570EC0 = 961
16802: 062036142310FB36 = 466
16810: 00230D20F306170E = 567
16818: 203E0500CD624120 = 512
16826: F83E00ED47DD2104 = 1068
16834: 41C921DFD6112100 = 786
16842: F93EFE061610FE06 = 815
16850: C0ED78D3FF19CDEC = 1481
16858: 41052D341C09202 = 893
16866: CD2020DD21C441C3 = 949
16874: A402E9CD9D413A35 = 937
16882: 40E630324F413A34 = 848
16890: 40324E410E150616 = 329
16898: 2F4E417EE6083C57 = 699
16906: 3F3440E6C1C506CD = 874
16914: 6241051520F9C602 = 670
16922: CD6241214E41340D = 609
16930: 20DCC91604E57ECD = 1039
16938: 6241E123CC79FE20 = 842
16946: 2003040E00AF1520 = 281
16954: ECC9AF010000215E = 740
16962: 41C0254C0A216141 = 769
16970: 7E3CFE1428037718 = 645
16978: E9360A2E18F20100 = 607
16986: 10F2010A0A0A0A21 = 332
16994: 50413600237DFE59 = 702
17002: 20F811584206091A = 492
17010: 77231310FACDED41 = 946
17018: CD3C42210057ED5B = 773
17026: 5C41192254 11ED18 = 677
17034: 5841ED4352412142 = 703
17042: 41CD254221E0417E = 677
17050: FE00C215433A2340 = 697
17058: FEFFC40D42ED4352 = 1386
17066: 410C79FE2020030E = 533
17074: 00042A5441237EFE = 610
17082: C9200511E800197E = 638
17090: E25441FE03CA8E43 = 900
17098: FE14C25D43ED5B5A = 1046
17106: 41187AB320FBC38C = 1011
17114: 4200002A54411107 = 281
17122: 011922D5417EFE14 = 511
17130: 2806FE94C0CD4742 = 982
17138: ED4BE2410C0C0479 = 608
17146: FE1FC8FE203E04D5 = 1045
17154: 204F04ED43DE42AF = 879
17162: 3E04CD6241215041 = 612
17170: CBC6C900ED4EDB42 = 1139
17178: AFCD62410478FE17 = 941
17186: 2007AF325041C33F = 763
17194: 422A564111080119 = 312
17202: 2256417EFE14280E = 639
17210: 215041347EFE0828 = 655
17218: E1C5CD4742C13E04 = 1023
17226: CD6241ED43D842C3 = 1152
17234: A74211001018 7AE3 = 594
17242: 20FBC9ED4B524121 = 976
17250: 4641CD2542CD5443 = 799
17258: ED4B5241214A41CD = 836
17266: 25420D0D79FEFF20 = 791
17274: 030E1F05CD5443AF = 581
17282: CD52413A2540FEFF = 1037
17290: 28F9C36142011F16 = 701
17298: AFCD62410DF0412A = 1095
17306: 5A41110C80ED5222 = 725
17314: 5A41215941342A5C = 528
17322: 4111080119225C41 = 307
17330: C37D42 = 386
```

Shape transformation

Igor Pandzic, Zagreb, Yugoslavia

Oric

SHAPE TRANSFORMATION is a version of Pikchachanja — *Your Computer* April 1985 — that works on the Oric-1 48K. You have to enter two shapes, each consisting of the same number of lines, and then you can watch the smooth 16-frame transformation of one shape into another.

When you start the program it first loads the machine code into memory. Then you are asked about the number of lines per shape — maximum is 43. The program moves to Hires mode and draws a square in the middle of the screen and a cursor in it. You can draw your pictures only in that square. Move the cursor using the arrow keys and change the cursor jump by "," and "." keys.

To enter the beginning of the line press B. You can change the beginning as many times as you wish. To finish the line press Return. Don't try to press it when the cursor is on the beginning of the line. You can delete the last line using Del. Unless you define it differently, the beginning of the next line is on the end of the last line. When you have entered the first shape you have the option of leaving it on the screen while you are drawing the second one or you can clear the screen.

While you are drawing, the display shows the cursor position, the cursor jump, the number of the line and the position of the beginning of the line, which is also shown by a dot.

When you have finished entering shapes you will have to wait for a while, while the computer is calculating and storing the intermediate frames.

And now the most exciting moment. The screen clears and the menu appears. You can choose one of these options: F to see the transformation of the first shape into another, B for the inverse, M for the continuous forwards-backwards moving, N to enter the new shapes, C to continue and Q to quit. To continue means that the last shape now becomes the first shape and you have to enter only one shape. This facility is especially useful for the owners of video recorders, because they can make longer animation sequences and record them to the tape.

The program consists of the basic and two short machine-code routines. The first machine-code routine — at address &400 — transfers data from the screen to memory, and the second one (&460) does the inverse thing. There are 16 frames and they are stored above the Himem address 6499. Each frame takes 2000 bytes.

```
0 REM*********************************
1 REM***    SHAPE TRANSFORMATION     ***
2 REM***      By Igor Pandzic        ***
3 REM***      '1985 PISoftware       ***
4 REM*********************************
5 HIMEM6499
10 GOSUB100
20 GOSUB200
30 GOSUB400
40 GOSUB480
99 END
100 REM********LOAD M/C***************
105 TEXT
110 CLS:PAPER4:INK0:PRINT"LOADING DATA"
120 FORR=£400TO£400+83
130 READD$:D=VAL("£"+D$):POKER,D
140 NEXTR
145 FORR=£460TO£460+83
150 READD$:D=VAL("£"+D$):POKER,D
160 NEXTR
199 RETURN
200 REM********ENTER SHAPES***********
204 CLS
205 TEXT:PAPER4:INK0:PRINT:PRINT:PRINT:PRINT
220 INPUT"NUMBER OF LINES PER SHAPE";NP
225 DIMX(1,NP,1):DIMY(1,NP,1)
230 NS=0:GOSUB250
231 PRINT:PRINT
235 PRINT"WOULD YOU LIKE THE FIRST SHAPE ON SCREEN WH
ILE YOU ARE DRAWING THE LA
ST?"
236 GETA$:IFA$="Y"THENNS=1:GOSUB252:GOTO249
238 IFA$<>"N"THEN236
240 NS=1:GOSUB250
249 RETURN
250 HIRES:CURSET59,49,1:DRAW121,0,1:DRAW0,101,1:DRAW-
121,0,1:DRAW0,-101,1
252 PRINTCHR$(6);CHR$(17)
253 J=7
255 X=60:Y=50:NL=0
257 REPEAT:NL=NL+1:X(NS,NL,0)=X:Y(NS,NL,0)=Y
260 CURSETX+60,Y+50,1
262 CURSETX(NS,NL,0)+60,Y(NS,NL,0)-50,1
265 POKE£268,0
267 PRINT"LINE NR. ";NL;",BEGINS AT ";X(NS,NL,0);",";
Y(NS,NL,0)
270 IFNS=0THENPRINT"DRAWING FIRST SHAPE :CURSOR JUMP:
";J:GOTO275
273 IFNS=1THENPRINT"DRAWING LAST SHAPE  :CURSOR JUMP:
";J
275 PRINT"CURENT COORDINATES: ";X;",";Y;"      "
290 TT=PEEK(£311):T1=PEEK(£310)
292 IFTT=253ANDT1=188ANDJ<>1THENJ=J-1:GOTO260
293 IFTT=251ANDT1=188ANDJ<>99THENJ=J+1:GOTO260
295 IFX-J>=0ANDTT=223ANDT1=188THENCURSETX+60,Y+50,0:X
=X-J
300 IFX+J<=119ANDTT=127THENCURSETX+60,Y-50,0:X=X+J
305 IFY-J>=0ANDTT=247THENCURSETX+60,Y+50,0:Y=Y-J
310 IFY+J<=99ANDTT=191THENCURSETX+60,Y+50,0:Y=Y+J
315 IFTT=251THENCURSETX(NS,NL,0)+60,Y(NS,NL,0)+50,0:X
(NS,NL,0)=X:Y(NS,NL,0)=Y
316 IFTT<>223ORT1<>189ORNL=1THEN320
317 NL=NL-1:CURSETX(NS,NL,0)+60,Y(NS,NL,0)+50,0
318 DRAWX(NS,NL,1)-X(NS,NL,0),Y(NS,NL,1)-Y(NS,NL,0),0
320 IFTT<>223ORT1<>191THEN260
330 IFX<>X(NS,NL,0)ORY<>Y(NS,NL,0)THEN340
335 PRINT:PRINT:PRINT:PRINT"PLEASE DRAW LINES,NOT DOT
S!!":WAIT200:PRINT:PRINT:P
RINT:GOTO260
340 DRAWX-X(NS,NL,0),Y-Y(NS,NL,0),1
350 X(NS,NL,1)=X:Y(NS,NL,1)=Y
370 UNTILNL=NP
397 PRINTCHR$(6);CHR$(17)
399 RETURN
400 REM****CALCULATING AND STORING****
405 HIRES:PRINT:PRINT:PRINT
410 FORNR=0TO15
415 HIRES:POKE£268,0:PRINT
416 PRINT"CALCULATING AND STORING INTERMIDIATE FRAMES
... PLEASE WAIT"
```

```
420 FORNL=1TONF
425 FORN=0TO1
430 X1(N)=X(0,NL,N)+(X(1,NL,N)-X(0,NL,N))/15*NR
432 X1(N)=X1(N)+60
435 Y1(N)=Y(0,NL,N)+(Y(1,NL,N)-Y(0,NL,N))/15*NR
437 Y1(N)=Y1(N)+50
440 NEXTN
450 CURSETX1(0),Y1(0),1:IFY1(1)=Y1(0)ANDX1(1)=X1(0)TH
EN460
455 DRAWX1(1)-X1(0),Y1(1)-Y1(0),1
460 NEXTNL
465 DOKE£408,6500+NR*2000:CALL£400
470 NEXTNR
475 RETURN
480 HIRES
490 PRINT:PRINT:PRINT
495 PRINT"(F)ORWARDS,(B)ACKWARDS,(M)OVING,(C)ONTINUE,
(N)EW,(Q)UIT"
500 GETA$
505 IFA$="M"THENGOSUB550
510 IFA$="F"THENGOSUB600
515 IFA$="B"THENGOSUB650
530 IFA$="C"THEN800
535 IFA$="N"THENRUN
540 IFA$="Q"THENTEXT:STOP
549 GOTO460
550 REM**M**
555 HIRES:PRINT"PRESS ANYTHING FOR THE MENU"
560 GOSUB600
570 GOSUB650
580 IFKEY$<>""THEN480RETURN
590 GOTO560
599 RETURN
600 REM**F**
610 FORR=0TO15
620 DOKE£465,6500+R*2000
630 CALL£460
640 NEXT
649 RETURN
650 REM**B**
660 FORR=15TO0STEP-1
670 DOKE£465,6500+R*2000
680 CALL£460
690 NEXT
699 RETURN
800 REM**C**
810 FORNR=0TO1
820 FORNL=1TONP
825 X(0,NL,NR)=X(1,NL,NR):Y(0,NL,NR)=Y(1,NL,NR)
830 NEXTNL
840 NEXTNR
849 NE=1:GOSUB250:GOTO30
850 GOTO20
5000 DATAA2,64,A0,14,AD,3A,A7,8D,64,19,A9,1,18,6D,5,4
,8D,5,4,A9,0,6D,6,4,8D,6,4
5010 DATAA9,1,18,6D,0,4,8D,0,4,A9,0,6D,9,4,8D,9,4,88,
F0,3
5015 DATA4C,4,4,A9,14,18,6D,5,4
5020 DATA8D,5,4,A9,0,6D,6,4,8D,6,4,CA,F0,3
5025 DATA4C,2,4,A9,DA,8D,5,4,A9,A7,8D,6,4,60
5030 DATAA2,64,A0,14,AD,64,19,8D,DA,A7,A9,1,18,6D,68,
4,8D,68,4,A9,0,6D,69,4
5040 DATA8D,69,4,A9,1,18,6D,65,4,8D,65,4,A9,0,6D,66,4
,8D,66,4,88,F0,3
5045 DATA4C,64,4,A9,14,18
5050 DATA8D,68,4,8D,68,4,A9,0,6D,69,4,8D,69,4,CA,F0,3
5055 DATA4C,62,4,A9,DA,8D,68,4,A9,A7
5060 DATA8D,69,4,60
```

Graphics designer

David Hodgetts,
Tipton,
West Midlands.

C-16

Graphics Designer is a very useful utility program for the Commodore 16 and, though written for the 16, it will work on the Commodore +4. The program is an aid to designing user definable graphics; there are many useful functions of which a few need to be explained.

Create allows you to define up to 255 characters, 0-127 upper case and 128-255 lower case, reverse characters are created automatically by the computer.

The rest of the commands from the main menu are self explanatory, but when using the create command there is a help mode which offers a range of commands to make the creation of characters a lot faster.

1. Display the data for the character being created.
2. Invert the character (turn it upside down).
3. Mirror image the character (laterally invert it).
4. Reverse character.
5. Rotate character (this may not seem a true rotate, but it is, as every 90° the character returns to its original shape).
6. Clear character.
7. Reset character (set character back to its original form).
8. Return to editor.

It should be noted that a character cannot be stored while in the help mode, to do this you must return to the editor.

The save option saves the character set to tape as a program file, so to load back the character set from tape type:

LOAD"file name",1,1

It is vital that there should be a ,1,1 at the end of the load statement as it makes sure that the program file is loaded back into the same memory as it came from.

To access the graphics from either in a program, or in direct mode type:

POKE65298,PEEK(65298)AND251:POKE 65299,(PEEK(65299)AND3)OR48

To return to normal type:

POKE65298,196:POKE65299,209

Be sure when using UDGs in a program that any errors are trapped to a line switching back into normal mode, as if there is not an error will cause anything on the screen to become unreadable. If this happens then hold down the run-stop key and press reset. This will then enter you into the monitor, type X then return to get out of it, and you will still have your program in memory, which you would not have if you had used reset on its own.

```
10 POKE55,0:POKE56,46
20 TRAP 1440:DIMCH%(29)
30 GOSUB1340:SYS12032
40 VOL4
50 COLOR0,1:COLOR4,1:PRINT"GRAPHICS DESIGNER"
60 PRINT"     DEVELOPED BY DAVID HODGETTS "
70 PRINT" — — (C) 1984  HODGE-SOFT"
80 PRINT"COMMANDS"
90 PRINT"[1] CREATE CHARACTER"
100 PRINT"[2] DISPLAY CHARACTER SET"
110 PRINT"[3] COPY CHARACTER"
120 PRINT"[4] SAVE CHARACTER SET"
130 PRINT"[5] LOAD CHARACTER SET"
140 PRINT"[6] CLEAR CHARACTER SET"
150 PRINT"[7] RESET CHARACTERS"
160 PRINT"[8] FINISH PROGRAM"
170 GETKEYA$:X=VAL(A$)
180 IFX<1ORX>8THENSOUND1,500,10:GOTO170:ELSESOUND1,900,10
190 ONXGOTO200,700,950,1220,1290,1050,930,1940
200 PRINT"PLEASE ENTER CHAR CODE":PRINT"0-127 UPPER CASE,128-255 LOWER CASE
"
210 INPUT"CHAR CODE",C$:IFVAL(C$)<0ORVAL(C$)>255THENSOUND1,300,10:GOTO200
220 SOUND1,900,10:PRINT"THE CURRENT COMMAND IS CREATE"
230 PRINT"________":FORA=0TO7:PRINT"|        |":NEXT
240 PRINT"________"
250 PRINT"RETURN STORES CHARACTER AND ENTERS"SPC(11)"GRAPHICS DISPL
AY MODE"
260 PRINT"CURSOR KEYS TO MOVE PIXEL CURSOR"
270 PRINT"[+] TO PLOT PIXEL [-] TO UNPLOT PIXEL"
280 PRINT""TAB(14);CHR$(27)"T"
290 PRINT""TAB(36);CHR$(27)"B"
300 GOSUB1430
310 GOSUB670
320 J=3135:P=J:K=0:L=0
330 GETA$:IFA$=CHR$(13)THENPRINT"PLEASE WAIT":GOSUB873:PRINT"":GOTO700
340 IFA$="H"THENGOSUB440:GOSUB1430
350 POKEP,43ORPEEK(P)AND128
360 IFA$="+"ORA$="-"THENIFA$="-"THENPOKEP,43:ELSEIFA$="+"THENPOKEP,171
370 IFA$<>""ANDA$<>""ANDA$<>""ANDA$<>""THEN330
380 IFA$=""THENK=K-1:IFK<0THENK=7
390 IFA$=""THENK=K+1:IFK>7THENK=0
400 IFA$=""THENL=L-1:IFL<0THENL=7
410 IFA$=""THENL=L+1:IFL>7THENL=0
420 POKEP,32ORPEEK(P)AND128
430 P=J+K+L*40:GOTO330
440 POKEP,32ORPEEK(P)AND128
450 PRINT"[1] DISPLAY DATA"
460 PRINT"[2] INVERT CHARACTER"
470 PRINT"[3] MIRROR IMAGE CHAR"
480 PRINT"[4] REVERSE CHAR"
490 PRINT"[5] ROTATE CHARACTER"
500 PRINT"[6] CLEAR CHARACTER"
510 PRINT"[7] RESET CHARACTER"
520 PRINT"[8] RETURN TO EDITOR"
530 GETKEYA$:IFVAL(A$)<1ORVAL(A$)>8THEN530
540 IFVAL(A$)<>3ANDVAL(A$)<>4THENQJ=0
550 ONVAL(A$)GOSUB580,600,620,640,1100,660,670
560 IFA$="8"THENRETURN
570 GOTO440
580 PRINT"DATA FOR CHAR "C$"=":FORA=0TO7:FORR=0TO7:IFPEEK(3195+A*40+R)=160THENQ
=Q+2↑R
590 NEXT:PRINTQ;:Q=0:NEXT:PRINTCHR$(13)"PRESS ANY KEY TO CONT":GETKEYA$:RETURN
600 FORA=0TO7:FORR=0TO7:CH%(R)=PEEK(3195+R*40+A):NEXT
610 FORR=0TO7:POKE3195+R*40+A,CH%(7-R):NEXTR,A:RETURN
620 FORA=0TO7:FORR=0TO7:CH%(R)=PEEK(3195+A*40+R):NEXT
630 FORR=0TO7:POKE3195+A*40+R,CH%(7-R):NEXTR,A:RETURN
640 FORA=0TO7:FORR=0TO7:JJ=3195+A*40+R:IFPEEK(JJ)=160THENPOKEJJ,32:ELSEPOKEJJ,16
0
650 NEXTR,A:RETURN
660 FORA=0TO7:FORR=0TO7:POKE3195+A*40+R,32:NEXTR,A:RETURN
670 X=VAL(C$):FORA=0TO7:JJ=PEEK(12288+A+X*8):FORR=0TO7
680 IF(JJAND(2↑R))<>0THENPOKE3195+A*40+(7-R),160:ELSEPOKE3195+A*40+(7-R),32
690 NEXTR,A:RETURN
700 PRINT"GRAPHICS MODE"
710 PRINT"THIS DISPLAYS ANY GRAPHICS CREATED"
720 PRINT"DO YOU WISH TO DISPLAY THE GRAPHICS(Y/N)"
730 GETKEYA$:IFA$<>"Y"ANDA$<>"N"THEN730:ELSEIFA$="N"THEN50
740 SOUND1,900,10
750 PRINT"    UPPER OR LOWER CASE GRAPHICS (U/L)"
760 GETKEYL$:IFL$<>"U"ANDL$<>"L"THEN760:ELSESOUND1,900,10
770 PRINT"RETURN EXITS GRAPHICS MODE AND"SPC(16)"RETURNS TO MENU
"
780 PRINT"PRESS ANY KEY TO ENTER GRAPHICS MODE"
790 GETKEYA$:PRINT""
800 POKE65298,PEEK(65298)AND251:X=PEEK(65299):X=XAND3:X=XOR48:POKE65299,X:Z=0:T=
0
810 IFL$="U"THENPRINTCHR$(142):ELSEPRINTCHR$(14)
820 FORY=0TO25STEP2:DO:POKE3072+Y*40+2*Z,T:Z=Z+1:T=T+1:LOOPUNTILZ=20ORT=256
830 Z=0:NEXT
840 GETKEYA$:IFA$<>CHR$(13)THEN840
850 POKE65298,196:POKE65299,209
860 GOTO50
870 POKEP,32ORPEEK(P)AND128
```

(continued on next page)

(continued from previous page)

```
880 FORA=0TO7:FORR=0TO7:IFPEEK(3195+A*40+(7-R))=160THENG=G+2↑R
890 NEXT:POKE12288+(VAL(C$))*8+A,G:G=0:NEXT:RETURN
900 PRINT"THE CURRENT COMMAND IS RESET"
910 PRINT"RESET CHARACTERS:SURE (Y/N)":GETKEYK$:IFK$="N"THEN50:ELSESYS12
032
920 SOUND1,900,10
930 PRINTTAB(8)"CHARACTERS NOW RESET!"SPC(17)"PRESS ANY KEY TO CONTINU
E"
940 GETKEYK$:GOTO50
950 PRINT"THE CURRENT COMMAND IS COPY"
960 PRINT"THIS ALLOWS ONE CHARACTER TO BE COPIED"SPC(14)"INTO ANOTHER"
970 PRINT"CHARACTERS 0-127 ONLY"
980 INPUT"COPY WHICH CHARACTER";C1$
990 IFVAL(C1$)<0ORVAL(C1$)>127THEN980:ELSESOUND1,900,10
1000 INPUT"INTO WHICH CHARACTER";C2$
1010 IFVAL(C2$)<0ORVAL(C2$)>127THEN1000:ELSESOUND1,900,10
1020 FORA=0TO7:POKE12288+VAL(C2$)*8+A,PEEK(12288+VAL(C1$)*8+A):NEXT
1030 GOTO50
1040 PRINT"":END
1050 PRINT"THE CURRENT COMMAND IS CLEAR"
1060 PRINT"CLEAR CHARACTERS:SURE (Y/N)":GETKEYK$:IFK$="N"THEN50
1070 SOUND1,900,10:SYS12073
1080 PRINTTAB(8)"CHARACTERS NOW CLEAR!"SPC(17)"PRESS ANY KEY TO CONTIN
UE"
1090 GETKEYK$:GOTO50
1100 OP=2ANDOP:QW=QW+1:IFQW<6THENQW=0
1110 FORSA=0TOOP:FORAA=0TO6-SA*2
1120 CH%(AA)=PEEK(3195+SA*41+AA)
1130 CH%(AA+7)=PEEK(2482-SA*41-AA)
1140 CH%(AA+14)=PEEK(3202+SA*39+AA*40)
1150 CH%(AA+21)=PEEK(2475-SA*39-AA*40)
1160 NEXT:FORAA=0TO6-SA*2
1170 POKE3196+SA*41+AA,CH%(AA)
1180 POKE2481-SA*41-AA,CH%(AA+7)
1190 POKE3242+SA*39+AA*40,CH%(AA+14)
1200 POKE3135-SA*39-AA*40,CH%(AA+21)
1210 NEXTAA,SA:RETURN
1220 PRINT"THE CURRENT COMMAND IS SAVE"
1230 PRINT"THIS ALLOWS YOU TO SAVE THE GRAPHICS"SPC(13)"YOU HAVE CREATED"
1240 PRINT"SET UP THE TAPE TO THE CORRECT POSITION"SPC(11)"AND PRESS ANY KEY
"
1250 GETKEYA$
1260 INPUT"FILE NAME";A$:IFLEN(A$)>16THENPRINT"NO MORE THAN 15 CHARACTERS":G
OTO1260
1270 FORFL=1TOLEN(A$):POKE6673+FL,ASC(MID$(A$,FL,1)):NEXT:POKE6673,LEN(A$)
1280 SYS12100:GOTO50
1290 PRINT"THE CURRENT COMMAND IS LOAD"
1300 PRINT"THIS ALLOWS YOU TO LOAD THE GRAPHICS"SPC(14)"YOU HAVE SAVED"
1310 PRINT"SET UP THE TAPE TO THE CORRECT POSITION"SPC(11)"AND PRESS ANY KEY
"
1320 GETKEYA$
1330 SYS12137:GOTO50
1340 FORA=0TO130:READN:POKE12032+A,N:NEXT:RETURN
1350 DATA162,0,134,135,162,208,134,140,162,0,134,141,162,48,134,142,160,0,177,13
9
1360 DATA145,141,230,139,208,2,230,140,230,141,208,2,230,142,165,142,201,64,208,
232,96
1370 DATA162,0,165,46,134,139,133,140,169,0,160,0,145,139,230
1380 DATA139,208,2,230,140,165,140,201,64,208,230,96
1390 DATA169,1,162,1,160,1,32,186,255,173,161,2,162,152,160,2,32,189
1400 DATA255,169,0,133,187,169,48,133,188,169,187,162,0,160,56,32,216,255,96
1410 DATA169,1,162,1,160,15,32,186,255,169,0,170,160,32
1420 DATA189,255,169,0,162,0,160,56,32,213,255,96
1430 PRINT"(HELP) ENTERS HELP MODE":RETURN
1440 POKE65298,196:POKE65299,209:PRINT"ER$(ER)CHR$(13)"ERROR IN LINE"EL:HEL
P
```

Utility

M.J. Davies,
Dyfed,
Wales.

Vic 20

THIS PROGRAM is a machine-code utility for any Commodore Vic-20. It supplies a number of useful functions by simple keystrokes.

The functions supplied are on the following keys and are all accessed by holding down Ctrl and tapping the required key:

- B : Gives bleep when a key is pressed.
- V : Stops bleep function.
- K : Gives key repeat.
- J : Stops key repeat.
- T : Switches quotes mode off
- Y : Switches quotes mode on.
- I : Switches off Inst mode.
- P : Pauses a listing at any point.
- @ : Continues the listing after Ctrl P.
- S : Switches all sound off excluding bleep.
- X : Run/Stop-Restore.

Most of the functions are self explanatory. However some will be obscure to some users and I will attempt to explain them.

First, quote mode off and on: I am sure that sometime during the time that a Vic user has had his machine, he'll have been entering a message inside quotes and have wanted to move around using the cursor keys. You'll have noticed that this is not easy because control characters appear. However using these functions this problem can be overcome.

Secondly, Inst mode off: This is rather similar to quotes mode off; however it is used when a large number of Insts have been entered that are not required.

Finally, Run/Stop-Restore using Ctrl X had to be included for emergencies. Usually, whenever a user wishes to stop a program, they will press Run/Stop-Restore automatically and would thus immediately disable Vic Utilities. For this reason, Run/Stop-Restore is deliberately disabled and Ctrl X is used instead to give the user a chance to "look before he leaps". If Ctrl X is used, then Vic Utilities may still be used by using Sys 695.

The machine code takes up only 256 bytes and is located at the top of memory. The loader calculates all relevant jumps and protects the program so that the program will run on all Vic-20s.

Unfortunately, the program cannot be used with the Programmers Aid or Super Expander cartridges.

```
10 CLR:POKE52,PEEK(52)-1:POKE56,
PEEK(56)-1:CLR
20 PRINT"****VIC  UTILITIES****
":PRINT"*COPYRIGHT M.J.DAVIES*"
30 PRINT"***10 FEBRUARY 1984***"
:FORA=1TO3500:NEXT
40 FORA=673TO694:READB:POKEA,B:N
EXT
50 FORA=695TO722:READB:POKEA,B:N
EXT
60 POKE707,PEEK(51):POKE712,PEEK
(52)
70 FORA=(PEEK(55)+PEEK(56)*256)T
O(PEEK(55)+PEEK(56)*256+145):REA
DB:POKEA,B:NEXT
80 P=PEEK(55)+PEEK(56)*256:X=INT
((P+119)/256):Y=P-X*256+119
90 POKEPEEK(55)+PEEK(56)*256+50,
Y:POKEPEEK(55)+PEEK(56)*256+51,X

100 PRINT"****VIC  UTILITIES***
*"
110 PRINT"KEY PRESSES:-":PRINT"
KEY BLEEP ON   : CTRL B";
120 PRINT"KEY BLEEP OFF  : CTRL
 V";:PRINT"KEY REPEAT ON  : CTRL
 K";
130 PRINT"KEY REPEAT OFF : CTRL
 J";:PRINT"QUOTES OFF     : CTRL
 T";
140 PRINT"QUOTES ON      : CTRL
 Y";:PRINT"INST MODE OFF  : CTRL
 I";
150 PRINT"PAUSE LISTING  : CTRL
 P";:PRINT"CONT. LISTING  :
@";
160 PRINT"SOUND OFF      : CTRL
 S";:PRINT"RUN/STOP-REST.: CTRL
 X";
170 PRINT"  TO RE-ENABLE AFTER
   CTRL X USE SYS 695"
180 SYS695:NEW
190 DATA165,197,201,13,208,13,17
3,141,2,41,4,240,6,165,197,201,5
3,208,250,76,112,247
200 DATA120,169,161,141,40,3,169
,2,141,41,3,169,0,141,143,2,169,
0,141,144,2,169,2,141
210 DATA30,145,88,96
220 DATA173,141,2,41,4,240,38,16
5,197,201,35,240,42,201,27,240,4
4,201,44,240,46
230 DATA201,20,240,49,201,50,240
,52,201,11,240,54,201,12,240,56,
201,41,240,58,201
240 DATA26,240,73,201,54,240,3,3
2,0,0,76,220,235,169,0,133,251,2
40,240,169,100
250 DATA133,251,208,234,169,128,
141,130,2,208,227,169,0,141,138,
2,208,220,169,0,133,212
260 DATA240,214,169,1,133,212,20
8,208,169,0,133,216,240,202,169,
0,141,14,144,141,10,144
270 DATA141,11,144,141,12,144,14
1,13,144,240,183,0,165,251,201,1
00,240,20,169,15
280 DATA141,14,144,169,205,141,1
0,144,162,255,202,208,253,169,0,
141,10,144,96
290 REM  THIS PROGRAM COPYRIGHT
M.J. DAVIES 10 FEBRUARY 1984
```

Password

Blackburn,
Lancashire.

Spectrum

THIS PASSWORD program for the Spectrum 48K will cause the listing to be jumbled. Only the correct password will restore the program and the program cannot be run without it.

The program should be typed in as listed and SAVEd on tape.

After writing your message or short program the Password program should be loaded with Merge " ". Your program should not have any line numbered any higher than 9983. Then type

GOTO 9985

The program will ask for a password which, when Entered, will cause the screen to go blank and then show a Stop Statement.

You listing is now coded according to the password and can be saved as before with

SAVE "name" LINE 9985

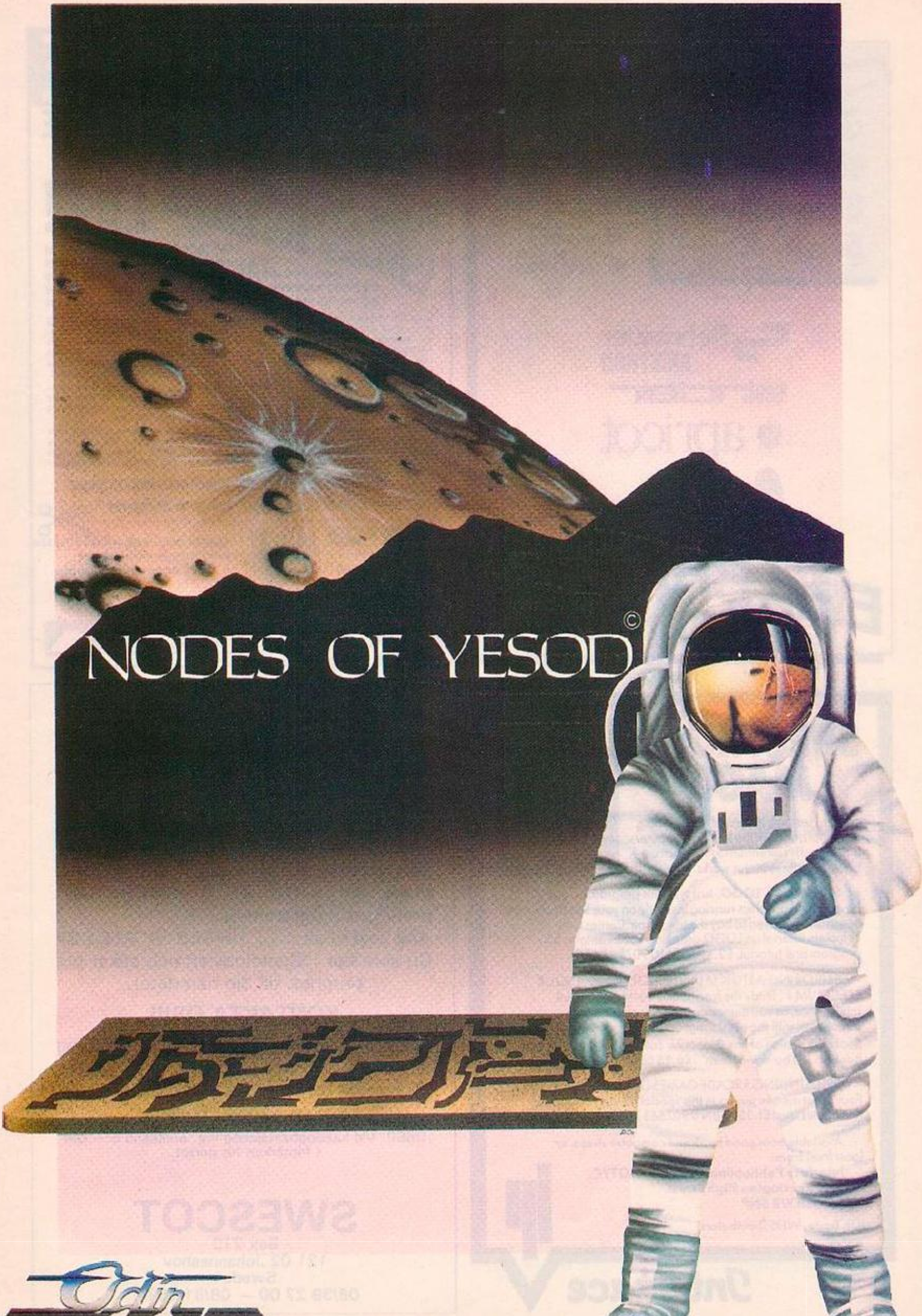
When the program is reloaded the correct password must be entered to run the program.

It works by XORing the byte in the Basic program listing with the ASCII code of the password which is sliced in a loop.

Line 9991 looks for line 9984 to prevent poking the password program itself. Lines 9991 and 9992 prevent Poking into undesirable places. The short machine code routine does the XORing.

If you take two numbers and XOR them, then take this result and XOR it with one of the original numbers you will get the second original number.

```
9984 STOP : STOP
9985 RESTORE : CLEAR 32499: LET
j=32500
9986 FOR i=0 TO 11: READ a: POKE
 j+i,a: NEXT i
9987 DATA 55,232,128,237,75,242,
128,6,0,169,79,201
9988 INPUT "Password?",a$
9989 LET x=1
9990 FOR n=23759 TO 1e8
9991 IF PEEK n=13 THEN LET n=n+4
: NEXT n
9992 IF PEEK n=14 THEN LET n=n+5
: NEXT n
9993 IF PEEK n=226 AND PEEK (n+2
)=226 THEN STOP
9994 POKE 33000,PEEK n: POKE 330
10,CODE a$(x)+128
9995 LET l=USR 32500: IF l<32 TH
EN NEXT n
9996 POKE n,l
9997 LET x=x+1
9998 IF x>LEN a$ THEN LET x=1
9999 NEXT n
```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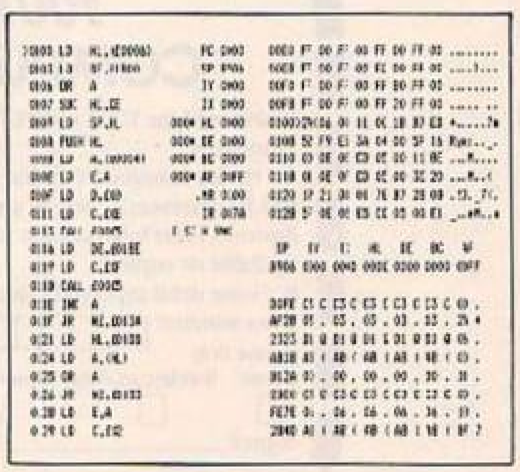

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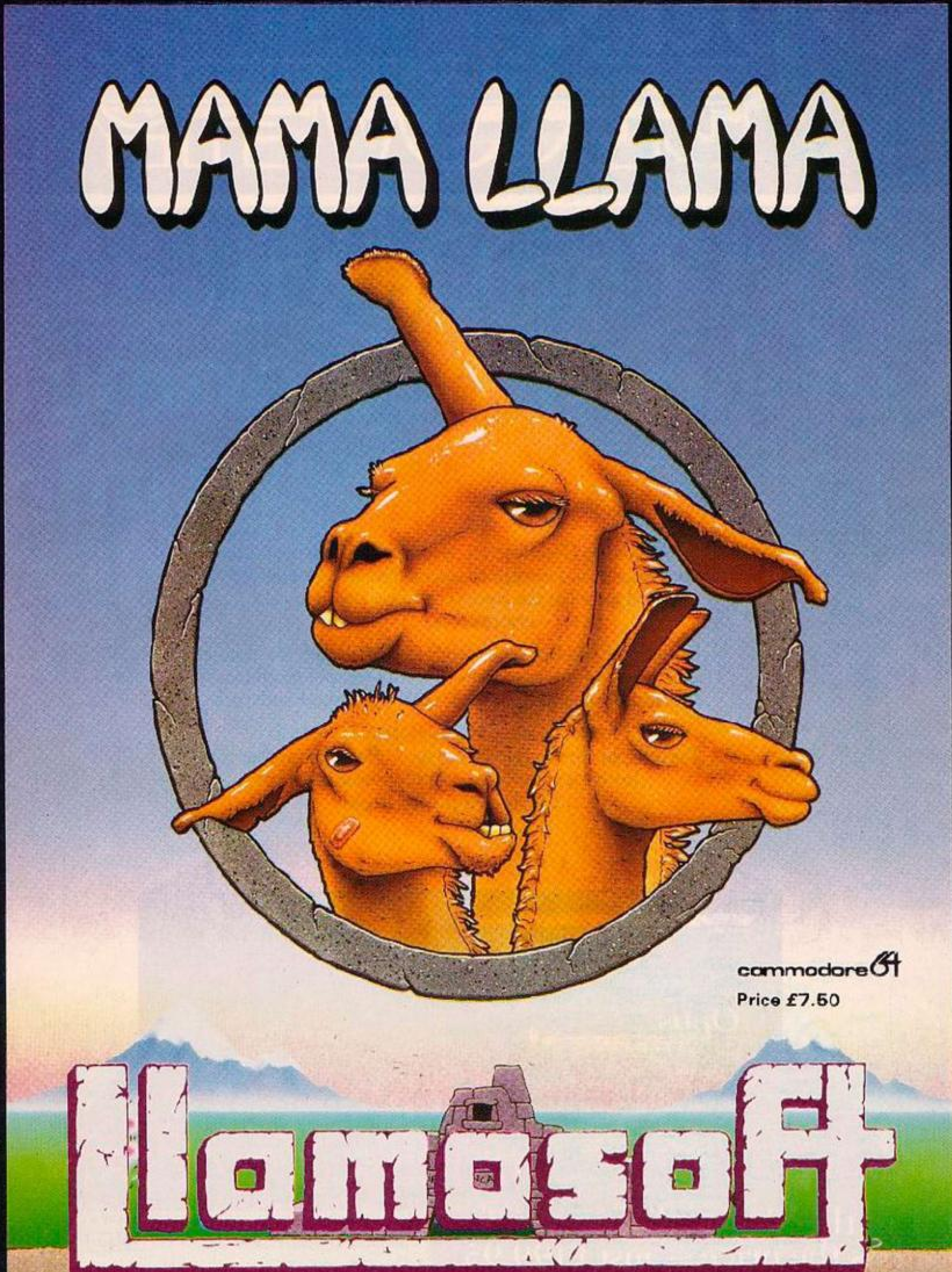

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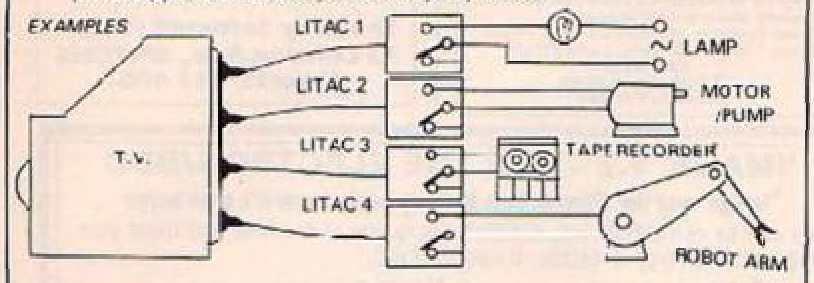
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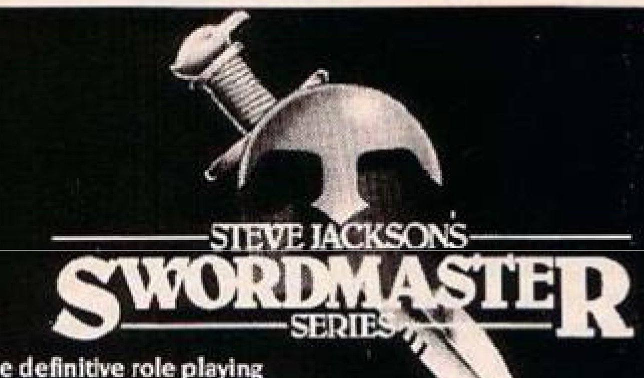
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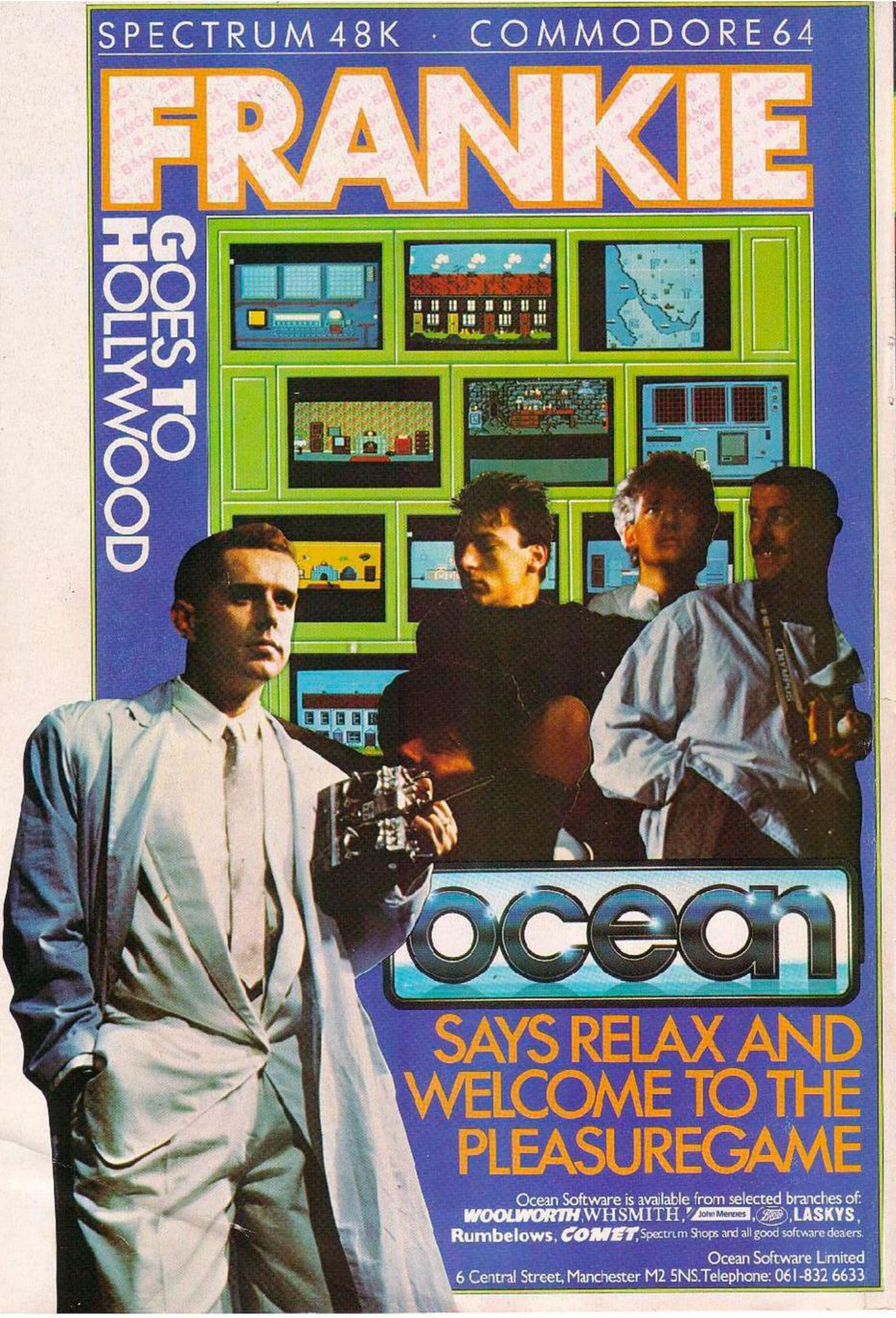

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